



BID DOCUMENTS AND SPECIFICATIONS FOR
BID# 24-03
MYSTIC STREET BRIDGE RECONSTRUCTION PROJECT
Arlington, Massachusetts

Prepared for: Department of Public Works
Town of Arlington, Massachusetts

Engineering Plans and Specifications by
Gill Engineering Associates, Inc.
Needham, MA

SEALED BIDS shall be received by:

Date: Thursday March 28, 2024

Time: 2:00pm

Place: Office of the Purchasing Agent
Arlington Town Hall Annex – 2nd Fl
730 Mass Ave.
Arlington, MA 02476

SECTION 00100
INVITATION FOR BID

In accordance with M.G.L. c.30, §39M, sealed bids are invited will be received by the Town of Arlington, Massachusetts, until **2:00 pm, Thursday, March 28, 2024**, at the Town Manager's Office/Purchasing Department, 730 Massachusetts Ave, Town Hall Annex – 2nd Floor, Arlington, Massachusetts, 02476, at which time and place they will be publicly opened and read aloud for:

BID #: 24-03 MYSTIC STREET BRIDGE RECONSTRUCTION PROJECT

PROJECT VALUE: \$1,771,473.32

CONTRACT END DATE: November 15, 2026

No bid shall be accepted, nor shall any bid be corrected, modified, or withdrawn, after the bid deadline.

Bid documents will be available for download after **11:00am on Thursday February 29, 2024** from the Town's website at arlingtonma.gov/purchasing.

Bids must be submitted on the forms provided and in a sealed envelope plainly marked with the name, address, and telephone number of the Bidder and with the words "**Bid #24-03 Mystic Street Bridge Reconstruction Project.**"

Bid bonds and Labor and Material Bonds are required. Every bid shall be accompanied by a bid deposit in an amount not less than 5% of the value of the bid, including any and all alternates. Bid deposits shall be in the form of a bid bond, or cash, or a certified check on, or a treasurer's or cashier's check issued by, a responsible bank or trust company and payable to the Town of Arlington. Bidders are reminded that the bid deposit covers the Town for damages when a Bidder withdraws its bid after the bid deadline. The Town will retain all bid deposits for withdrawn bids to the extent permitted by law.

Minimum Wage Rates as determined by the Director of the Massachusetts Department of Labor Standards under the provisions of M.G.L. c.149 §§26 to 27H, shall prevail in the execution of the work of this project. The schedule of wage rates applicable to this contract is included in the bid document.

Low bidders who accept contract awards will be required to comply with any and all Minority Business Enterprise (MBE) and Women's Business Enterprise (WBE) policies and participation goals of the Town. Bidders must submit any required MBE/WBE Forms/Letter of Intent & Schedules of Participation required by the Town to the Town for acceptance prior to beginning any scheduled work.

Potential contractors are invited to visit the project site and send written questions via email to the Town of Arlington Department of Public Works; Engineering Division no later than **2 PM on March 18, 2024**, at engineering@town.arlington.ma.us. Responses will be provided in the form of an Addendum on March 25, 2024. There will be no pre-bid meeting.

MassDOT prequalification of contractors with the class of work as, Bridge Construction, for the project with an estimated value of \$1,771,473.32 will be required."

Bid documents include Special Provisions for price adjustment clauses for hot mix asphalt, portland cement mixtures, diesel fuel and gasoline, and structural steel and reinforcing steel. Adjustments will be made to the Base Price Awards from the date of the contract award using the MassDOT [current contract price adjustments](#) posted on the MassDOT website.

Advertisement for Public Works Construction Services (MGL Ch 30, §39M)

- ARLINGTON ADVOCATE – Invitation For Bid; Thursday, February 29, 2024
- Posted at Arlington Town Hall; Thursday February 29, 2024
- Central Register; Wednesday February 28, 2024
- CommBUYS; Thursday February 29, 2024

CRITICAL DATES

Contract Executed: April 28, 2024

Work Completed by: November 15, 2026

Bidders must bid on each item. All entries in the Bid Form must be made clearly and in ink, or typewritten, and prices must be written in both words and figures in the spaces provided.

BIDDERS MUST ATTACH the following to THE BID FORM.

1. Price Sheets: (forms provided within Bid Document)
2. Certificate of Non-Collusion and Certificate of State Tax Compliance: (forms provided within Bid Document)
3. Municipal References: (name, address & telephone number), including project name and details for at least five (5) projects of a similar nature and cost performed within the past five (5) years, wherein the Contractor has provided services similar in type and application to this Bid Project.

The successful Bidder will be required to furnish, within 10 days of notification of contract award, a Labor and Materials or Payment Bond in the amount of 50% of the contract amount.

The Town will reject any and all bids when required to do so by Massachusetts General Laws. The Town reserves the right to waive any informalities in, or to reject any and all bids, if it deems it to be in the public interest so to do. The Town also reserves the right to reject any bid if it determines that such bid does not represent the bid of a person or firm competent to perform the work as specified, or if fewer than three bids are received, or if bid prices are not acceptable without further competition.

It is the intention of the Town to award the contract to the lowest responsible and eligible bidder offering the lowest price based on the Unit Prices proposed by the Bidder and the estimated quantities provided by the Town. These estimated quantities are not guaranteed.

Questions regarding bid procedure for this Invitation For Bid should be directed to Mary Ellen DeNatale, Purchasing Agent, at mdenatale@town.arlington.ma.us.

TOWN OF ARLINGTON

Jim Feeney
Town Manager

Date

SECTION 00200
INSTRUCTION TO BIDDERS

1. Receipt and Opening of Bids

The Town of Arlington, Massachusetts herein called the OWNER, acting by and through its Purchasing Department, will receive sealed Bids for the Mystic Street Bridge Reconstruction Project.

Such bids addressed to the Purchasing Department and endorsed Bid 24-30 Mystic Street Bridge Reconstruction Project will be received at the Town Hall Annex, 2nd Fl., Purchasing Department, 730 Massachusetts Avenue, Arlington, MA 02476 until 2:00 PM, on Thursday March 28, 2024 at which time and place said bids will be publicly opened and read aloud.

If the building at which bids are to be received is closed for any reason on the date and time that bids are due, receipt of bids by the Owner will be postponed until the next business day at the time originally stated for receipt of bids.

Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified will not be considered. By submission of a bid, the bidder agrees that this bid shall be good and may not be withdrawn for the number of days, after the opening of bids, as stipulated in the FORM OF GENERAL BID.

2. Location and Work to be Performed

The location, general characteristics, and principal details of the Work are indicated on a set of drawings titled "**Proposed Bridge Replacement A-10-015 (C10) US3 over Mill Brook**" included with this bid document.

Additional drawings showing details in accordance with which the Work is to be done may be furnished by addendum during the bidding period by the ENGINEER, and shall then become a part of the Contract Documents.

The CONTRACTOR shall furnish all supervision, labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, bailing, shoring, removal, and all other things necessary to do all work required for the completion of each item of the Work and as herein specified.

The Work to be done and paid for under any item shall not be limited to the exact extent mentioned or described but shall include all incidental work necessary or as customarily performed for the completion of that item.

3. Preparation of Bid

Each bid must be submitted on the prescribed form in Section 00410, FORM OF GENERAL BID. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, its address, and endorsed with the name of the project as specified in Receipt and Opening of Bids, above.

If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in Receipt and Opening of Bids, above.

4. Modification of Bids

Any bidder may modify its bid by written communication at any time prior to the scheduled closing time for receipt of bids. Any telegraphic communication must be received by the OWNER prior to the closing time, and, provided further, for any telegraphic communication that modifies a bid the OWNER is satisfied that a written confirmation of the modification over the signature of the bidder was mailed prior to the closing time.

The modification communication shall not reveal the bid price but shall provide the addition or subtraction or other modification so that the final prices or terms will not be known by the OWNER until the sealed bid is opened. If written confirmation is not received within two days from the closing time, no consideration will be given to the facsimile transmission.

5. Obligation of Bidder

At the time of the opening of bids each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Contract Documents (including all addenda). The failure or omission of any bidder to examine any form, instrument, or document shall in no way relieve any bidder from any obligation in respect of its bid.

6. Information not Guaranteed

All information given in the Contract Documents relating to subsurface and other conditions, natural phenomena, existing pipes, and other structures is from the best sources at present available to the OWNER. All such information is furnished only for the information and convenience of bidders and is not guaranteed.

It is agreed and understood that the OWNER does not warrant or guarantee that the subsurface or other conditions, natural phenomena, existing pipes, or other structures encountered during construction will be the same as those indicated in the Contract Documents.

It is further agreed and understood that no bidder or CONTRACTOR shall use or be entitled to use any of the information made available to it or obtained in any examination made by it in any manner as a basis of or grounds for any claim or demand against the OWNER or the ENGINEER, arising from or by reason of any variance which may exist between the information made available and the actual subsurface or other conditions, natural phenomena, existing pipes or other structures actually encountered during the construction work, except as may otherwise be expressly provided for in the Contract Documents.

7. Bid Security

Each bid must be accompanied by a certified check, a bid bond, cash, a treasurer's or cashier's check, payable to the OWNER, in the amount stated in Section 00100, ADVERTISEMENT FOR BIDS. Such deposits will be returned to all except the three lowest responsible and eligible bidders within five days, Saturdays, Sundays, and legal holidays excluded, after the opening of bids, and the remaining deposits will be returned promptly after the OWNER and the accepted bidder have executed the Contract, or if no notice of intent to award has been presented to any bidder within 30 days, Saturdays, Sundays and legal holidays excluded, after the date of the opening of bids, upon demand of the bidder at any time thereafter.

8. Time for Completion

The successful general bidder must agree to commence work on or before a date to be specified in the written "Notice to Proceed" from the OWNER and to fully complete the project within the time limit stated in Section 00410, FORM OF GENERAL BID.

9. Addenda and Interpretations

No interpretation of the meaning of the plans, specifications or other prebid documents will be made to any bidder orally, and if provided orally, shall not be relied upon by bidders unless confirmed in a written addendum. All information given to bidders other than by means of the plans, specifications, or by addenda, as described below, is given informally and shall not be used as the basis of a claim against the OWNER or the ENGINEER.

Potential contractors are invited to visit the project site and send written questions via email to the Town of Arlington Department of Public Works; Engineering Division no later than **2 PM on March 18, 2024**, at engineering@town.arlington.ma.us. Responses will be provided in the form of an Addendum on March 25, 2024. There will be no pre-bid meeting.

Every request for such interpretation should be in writing (typed, not handwritten) addressed to Weston & Sampson Engineers, Inc., 55 Walkers Brook Drive, Reading, Massachusetts 01867 Attention: CSD, or sent via email to Mahoney.Carolyn@wseinc.com and to be given consideration must be received at least ten working days prior to the date fixed for the opening of bids.

Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, when issued, may be viewed and downloaded as a Portable Document File (PDF) at www.accentblueprints.com. A notification of addenda will be emailed to all prospective bidders to email addresses furnished by them for such purposes. Bidders picking up sets of bid documents will be given all addenda issued to date and will be required to sign for all documents, acknowledging receipt. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under its bid as submitted, and each bidder must confirm for itself that it has received all addenda. All addenda so issued shall become part of the Contract Documents.

10. Bid Opening Procedure

The following list of requirements shall be met by each filed bid.

Bids shall be filed at the place and before the time specified in Receipt and Opening of Bids, above.

The bid and all accompanying documents so required shall be signed by the Bidder or its authorized representative before submission.

All bidders shall include with their bids written acknowledgment of receipt of all addenda. Refer to acknowledgment form provided in Section 00410, FORM OF GENERAL BID.

The total dollar amount of each bid will be read, and the three apparent lowest bids will be selected for further consideration. These three apparent low bids will be read aloud for the benefit of the other bidders and the bid opening procedure will be closed. All those present at the bid opening may examine all bids after the bid opening and after the reading of the three apparent low bids except for the DCAMM Update Statements if contained therein, which are not public records.

11. Comparison of Bids

Bids will be compared on the basis of the quantities and unit and lump sum prices stated in the bid forms.

In the event that there is a discrepancy in Section 00410, FORM OF GENERAL BID between the lump sum or unit prices written in words and figures, the prices written in words will govern.

The OWNER agrees to examine and consider each FORM OF GENERAL BID submitted in accordance with the terms and conditions set forth herein and as set forth in Section 00410, FORM OF GENERAL BID.

12. Statutes Regulating Competitive Bidding

Any bid, which does not comply with the provisions of Massachusetts General Laws Chapter 30, Section 39M as amended, need not be accepted and the OWNER may reject every such bid.

13. Right to Reject Bid

The OWNER may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids, should the OWNER deem it to be in the public interest to do so.

The OWNER may also reject bids which in its sole judgment are either incomplete, conditional, obscure or not responsive or which contain additions not called for, erasures not properly initialed, alterations, or similar irregularities, and may reject bids for any other reason permitted by law, or the OWNER may waive such omissions, conditions or irregularities.

14. Ability and Experience of Bidder

No award will be made to any bidder who cannot satisfy the OWNER that it has sufficient ability and experience in this class of work and sufficient capital and plant to enable it to prosecute and complete the work successfully within the time named. The OWNER's decision or judgment on these matters will be final, conclusive, and binding to the fullest extent permitted by law.

The OWNER may make such investigations as it deems necessary, and the bidder shall furnish to the OWNER, under oath if so required, all such information and data for this purpose as the OWNER may request.

15. Conditions of Work

Each bidder must inform itself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of its obligation to furnish all material and labor necessary to carry out the provisions of its contract. Insofar as possible the CONTRACTOR, in carrying out its work, must employ such methods or means as will not cause any interruption of or interference with the work of any other contractor.

16. Security for Faithful Performance

Simultaneously with its delivery of the executed Contract, the CONTRACTOR shall furnish a surety bond or bonds as security for faithful performance of this Contract and for the payment of all persons performing labor and materials under this Contract as specified in Section 00700, GENERAL CONDITIONS included herein, each in the amount of 100 percent of its bid. The surety on such bond or bonds shall be a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the OWNER. The bonds shall remain in force for one year after final acceptance of the work by the OWNER, unless the OWNER, in writing, releases the CONTRACTOR from the obligation sooner.

17. Power of Attorney

Attorneys-in-fact who sign Contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

18. Laws and Regulations

Applicable provisions of Massachusetts General Laws and Regulations and/or the United States Code and Code of Federal Regulations govern this Contract and any provision in violation of the foregoing shall be deemed null, void and of no effect. Where a conflict between Federal and State Laws and Regulations exists, the more stringent requirement shall apply.

The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances or bylaws, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

Attention is directed to Section 00830, STATE REGULATIONS and to other applicable sections of this specification. In the event of any conflict between provisions of law or regulation quoted or paraphrased in the Contract Documents, the actual provisions of law or regulation shall control.

19. Liquidated Damages for Failure to Enter into Contract

The successful bidder, upon its failure or refusal to execute and deliver the Contract, Bonds and Certificates of Insurance required within 10 days after receipt of notice of the acceptance of the bid, shall, except as otherwise provided by applicable law, forfeit to the OWNER, as liquidated damages for such failure or refusal, the security deposited with its bid, provided that the amount forfeited shall not exceed the difference between its bid price and the bid price of the next lowest responsible and eligible bidder. In case of death, disability, bonafide clerical or mechanical error of a substantial nature, or other similar unforeseen circumstances affecting the bidder, its bid deposit will be returned.

20. Indeterminate Items and Estimated Quantities

The work to be done under this Contract has been divided into parts or items, if applicable, to enable each bidder to bid on different portions of the work in accordance with its estimate of their cost and so that the actual quantity of work executed under each item may be paid for at the price bid for that particular item, even though each bidder may have judged that such quantity may be greater or less than the estimated quantity stated in Section 00410, FORM OF GENERAL BID.

21. CONTRACTOR Records

The CONTRACTOR shall comply with the provisions of Massachusetts General Laws, Chapter 30, Section 39R, concerning CONTRACTOR records. This section has been reprinted in Section 00830, STATE REGULATIONS.

22. Bidder Certification – OSHA Training

All employees who work on Massachusetts public works construction sites, on projects estimated to cost more than \$10,000, must have no less than ten (10) hours of OSHA- approved safety and health training.

The Massachusetts Attorney General is authorized to restrain award of construction contracts to any contractor who is in violation of this requirement and to restrain the performance of these contracts by non-complying contractors.

Noncompliance with this law will disqualify contractors from bidding on public contracts.

23. Prevailing Wage Rates

Prevailing Wage Rates as determined by the Director of the Executive Office of Labor and Workforce Development under the provision of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H, as amended, apply to this project. It is the responsibility of the bidder, before bid opening, to request if necessary, any additional information on Prevailing Wage Rates for those trades people who may be employed for the proposed work under this contract.

The Contractor is responsible for requesting up to date wage rates from the Owner prior to the one-year anniversary of the notice to proceed of this contract. The Owner shall obtain updated wage rates from the Director and provide them to the Contractor upon said request.

24. Price Adjustments

This Contract is subject to the provisions for material price adjustments in accordance with Chapter 30, Section 38A of the Massachusetts General Laws.

25. Minority and Women Business Enterprise Requirements

Minority-owned Business Enterprise (MBE), Women-owned Business Enterprise (WBE) and Equal Employment Opportunity polices of the Massachusetts Water Resources Authority (MWRA) are applicable to this Contract. The Contractor shall comply with all applicable laws and regulations pertaining to nondiscrimination, equal opportunity and affirmative action, including without limitation executive orders and rules and regulations of federal and state agencies of competent jurisdiction. The Contractor shall make positive efforts to achieve: (1) a minority employee work force goal of 15.3

percent, (2) a woman employee work force goal of 6.90 percent, (3) a goal of 7.24 percent participation of Minority-owned Business Enterprise(s), and (4) a goal of 3.60 percent participation of Woman-owned Business Enterprise(s) within project contracts. At a minimum, the Contractor should allow MBEs and WBEs the maximum feasible opportunity to compete for subagreements to be performed under the project.

END OF SECTION

SECTION 00331

INSPECTIONS, LOGS, REPORTS AND FIELD OBSERVATIONS PROVIDED BY THE OWNER

PART 1 – GENERAL

1.01 PURPOSE:

A. PURPOSE OF INSPECTIONS, LOGS, REPORTS AND FIELD OBSERVATIONS:

1. The purpose of the MassDOT Bridge Inspection Reports is to provide a compilation of the existing information available pertaining to the existing Mystic Street Bridge Design due to the lack of complete historical documentation and to provide additional information about the condition of the existing bridge.
2. These inspection reports in addition to field observations and ground surveying provided the foundation of the existing information utilized for the design of the Mystic Street Bridge Reconstruction Project Design.
3. The Information reported from these Reports are those observed in the field at the particular location and at the time observations were made, and do not necessarily represent the present conditions.

1.02 SCOPE:

A. BRIDGE INSPECTION REPORTS:

1. Bridge Inspection Reports have been performed, with reasonable care by MassDOT Staff. The results of the inspection program are appended hereto and are a part of the Contract Documents. Contractors may, after obtaining Owner's permission, carry out additional inspections, at no expense to the Owner.
2. Bridge Inspection Reports provided in the Contract Documents are limited by the methods used for obtaining and expressing such data and is subject to various interpretations. The terms used to describe conditions encountered are subject to local usage and individual interpretation.
3. Inspections have been taken substantially at the locations indicated on the drawings and shown on the logs. Information presented in the inspection logs, as to the pipe condition, material build up in the pipe; etc. is based on visual observation from the videos. Information reported on the TV Inspection Reports are those observed in the field at the particular location and at the time the videos were taken, and do not necessarily represent the present conditions. Condition of the pipeline, material build up in the pipe, and other factors may differ now from those originally observed. Contractors should be aware that present conditions might affect methods of construction.

B. GEOTECHNICAL REPORT:

1. The Geotechnical Report, dated December 2017 and prepared by Gill Engineering is included with these bid documents. This report was prepared in conjunction with the requirements of the Mystic Street Bridge Design and contains relevant geotechnical data utilized for the bridge design including soil borings and information related to the subsurface exploration program for the design development of the Mystic Street Bridge Reconstruction Project as well as the available historic plans for the existing bridge.

C. HYDRAULIC DESIGN REPORT

1. The Hydraulic Design Report Geotechnical Report, dated December 2017 and prepared by Weston & Sampson Engineers is included with these bid documents. This report was

prepared in conjunction with the plan development of the Mystic Street Bridge Design and was utilized to determine the hydraulic conditions of Mill Brook on the Mystic Street Bridge to ensure all permitting requirements and flow conditions are met. The report contains relevant data pertinent to the design of the abutments, bridge deck and scour analysis utilized in the bridge design to ensure that the bridge components are protected and flood conditions are minimized.

D. MISCELLANEOUS: Historic Trolley Track Plan

1. Manhole Inspection Reports provided in the Contract Documents are limited by the methods used for obtaining and expressing such data and is subject to various interpretations. The terms used to describe conditions encountered are subject to local usage and individual interpretation.

PART 2 – PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

1. EXECUTION:

- The inspections, logs, reports, field observations and plans are for the general information of the Contractors. Contractors are obligated, to examine the site, records of investigations and other data pertinent to the site, and then, based upon their own interpretations and investigations, decide the character and quantity of material to be encountered, the difficulties or obstacles likely to be encountered, and other conditions affecting the work. The inspections, logs, reports, and field observations should be considered accurate representations only at the particular locations and times the original inspections were made. No other warranty, either expressed or implied, by the Owner, Engineer or their agents is made to the accuracy of the information contained or other data shown on the drawings or presented in the Contract Documents.

SECTION 00410
FORM OF GENERAL BID

TO THE AWARDING AUTHORITY:

- A. The undersigned proposes to provide all necessary tools and apparatus and furnish all labor and materials necessary to perform the work required for the:

Mystic Street Bridge Reconstruction Project

Bid No. 24-03

Arlington, MA 02476

in the manner and time prescribed in the bid and contract documents and incorporated herein by reference, for the Contract Price specified below, subject to additions and deductions according to the terms of the Specifications.

CRITICAL DATES

Contract Executed: April 28, 2024 (estimated)

Work Completed by: November 15, 2026

- B. This Proposal includes the following Addenda:

No. _____ Dated _____

No. _____ Dated _____

No. _____ Dated _____

- C. The proposed Total Price for Contract: **See attached Price Sheets** to be completed and submitted with bid.

- D. The undersigned hereby certifies, under the pains and penalties of perjury, that he has carefully examined the Contract Documents, established a thorough understanding of the existing conditions, and has obtained sufficient information for executing the work of his Proposal and the work of all related trades.

- E. The undersigned agrees that, if selected as Contractor, he will within five (5) days, Saturdays, Sundays, and legal holidays excluded, after presentation thereof by the Awarding Authority, execute the Contract in accordance with the terms of this Proposal.

- F. The undersigned hereby certifies that he is able to furnish labor that can work in harmony with Owner's separate contractor(s) and all other elements of labor employed or to be employed on the work and that he/she will comply fully with all laws and regulations applicable to awards made subject to MGL c.149, § 44A.

- G. The undersigned hereby certifies, under the pains and penalties of perjury, that the foregoing Proposal is based upon the payment to laborers to be employed on the project of wages in an amount no less than the applicable prevailing wage rates established for the project by the Massachusetts Department of Labor Standards. The undersigned agrees to

indemnify the awarding authority for, from and against any loss, expense, damages, actions or claims, including any expense incurred in connection with any delay or stoppage of the project work, arising out of or as a result of (1) the failure of the said Proposal to be based upon the payment of the said applicable prevailing wages rates or (2) the failure of the Proposer, if selected as the contractor, to pay laborers employed on the project the said applicable prevailing wage rates.

- H. The undersigned hereby certifies that all employees to be employed at the worksite shall have successfully completed a course in construction safety and health approved by the **OSHA** that is at least **10 hours** in duration at the time the employee begins work and that said undersigned shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.
- I. **The undersigned further certifies under the penalties of perjury that this Proposal is in all respects bona fide, fair and made without collusion or fraud with any other person.** As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.
- J. The undersigned further certifies under penalties of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of Section 29F of Chapter 29, or any other applicable debarment provisions of any chapter of the General Laws or any rule or regulation promulgated thereunder.

Date: _____

Bidder's Company/Firm Name

Authorized Signature

Print Name & Title

Business Address

Business Phone/Fax

Business Email

Bidders must bid on each item. All entries in the Bid Form must be made clearly and in ink, or typewritten, and prices must be written in both words and figures in the spaces provided.

BIDDER MUST ATTACH the following TO THIS BID FORM:

1. Price Sheets (forms provided herein)
2. Certificate of Non-Collusion (form provided herein)
3. Certificate of State Tax Compliance (form provided herein)
4. References (name, address and telephone number) and project details for at least five (5) contracts of a similar nature, performed within the past five (5) years, wherein the Contractor has serviced, maintained, and provided repair service covering equipment of the same type and application.
5. Proof of Liability and Workers Compensation Insurance.
6. Bid Deposit

BID PRICE SHEET #1

LI ST #	ITEM	DESCRIPTION	QTY	UNI TS	UNIT PRICE	Amount
1	100	SCHEDULE OF OPERATIONS - FIXED PRICE \$	1	LS		
2	115. 1	DEMOLITION OF BRIDGE NO. A10015	1	LS		
3	120	EARTH EXCAVATION	110	CY		
4	140	BRIDGE EXCAVATION	405	CY		
5	141	CLASS A TRENCH EXCAVATION	25	CY		
6	142	CLASS B TRENCH EXCAVATION	32	CY		
7	144	CLASS B ROCK EXCAVATION	5	CY		
8	151	GRAVEL BORROW	55	CY		
9	151. 1	GRAVEL BORROW FOR BRIDGE FOUNDATION	85	CY		
10	156	CRUSHED STONE	5	TO N		
11	170	FINE GRADING AND COMPACTING SUBGRADE AREA	55	SY		
12	201	CATCH BASIN	4	EA		
13	202	MANHOLE	3	EA		
14	204	GUTTER INLET	1	EA		
15	221	FRAME AND COVER	4	EA		
16	222. 1	FRAME AND GRATE - MASSDOT CASCADE TYPE	4	EA		
17	224. 12	12 INCH HOOD	4	EA		
18	238. 1	10 INCH DUCTILE IRON PIPE	15	FT		
19	238. 15	15 INCH DUCTILE IRON PIPE	25	FT		
20	241. 12	12 INCH REINFORCED CONCRETE PIPE	7	FT		
21	302. 06	6 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET)	20	FT		
22	302. 08	8 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET)	100	FT		
23	303. 08	8 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT)	80	FT		
24	309	DUCTILE IRON FITTINGS FOR WATER PIPE	250	LB		
25	345. 6	6 INCH TEMPORARY SERVICE PIPE	1200	FT		
26	350. 06	6 INCH GATE VALVE AND BOX	1	EA		
27	350. 08	8 INCH GATE VALVE AND BOX	4	EA		
28	373. 08	8 INCH WATER PIPE INSULATION	80	FT		
29	376	HYDRANT	1	EA		
30	402	DENSE GRADED CRUSHED STONE FOR SUB-BASE	25	CY		

BID PRICE SHEET #2

31	415.1	PAVEMENT STANDARD MILLING	305	SY		
32	440	CALCIUM CHLORIDE FOR ROADWAY DUST CONTROL	915	LB		
33	443	WATER FOR ROADWAY DUST CONTROL	10	MG L		
34	451	HMA FOR PATCHING	5	TON		
35	452	ASPHALT EMULSION FOR TACK COAT	65	GAL		
36	453	HMA JOINT SEALANT	325	FT		
37	460.22	SUPERPAVE SURFACE COURSE - 9.5 (SSC - 9.5)	45	TON		
38	460.32	SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC 19.0)	30	TON		
39	460.42	SUPERPAVE BASE COURSE - 37.5 (SBC 37.5)	55	TON		
40	472	TEMPORARY ASPHALT PATCHING	5	TON		
41	482.4	SAWCUTTING PORTLAND CEMENT CONCRETE	45	FT		
42	504	GRANITE CURB TYPE VA4 - STRAIGHT	130	FT		
43	581	CURB INLET REMOVED AND RESET	4	EA		
44	697.1	SILT SACK	10	EA		
45	697.2	FLOATING SILT FENCE/TURBIDITY CURTAIN	50	FT		
48	701	CEMENT CONCRETE SIDEWALK	45	SY		
49	748	MOBILIZATION	1	LS		
50	751	LOAM BORROW	5	CY		
51	765	SEEDING	30	SY		
52	767.121	SEDIMENTATION CONTROL BARRIER	200	FT		
53	852	SAFETY SIGNING FOR TRAFFIC MANAGEMENT	320	SF		
54	853.1	PORTABLE BREAKAWAY BARRICADE TYPE III	2	EA		
55	853.2	TEMPORARY BARRIER (TL-2)	180	FT		
56	853.21	TEMPORARY BARRIER REMOVED AND RESET	290	FT		
57	853.501	TEMPORARY IMPACT ATTENUATOR REMOVED AND RESET	4	EA		
58	853.72	TEMPORARY IMPACT ATTENUATOR BI-DIRECTIONAL, NON-REDIRECTIVE	2	EA		
59	854.036	TEMPORARY PAVING MARKINGS - 6 INCH (TAPE)	2155	FT		
60	854.1	PAVEMENT MARKING REMOVAL	75	SF		
61	859	REFLECTORIZED DRUM	1020	DAY		

BID PRICE SHEET #3

BID PRICE SUMMARY FORM

TOTAL AMOUNT OF BID (List # 1 to 68, inclusive) is:

Dollars
(In Words)

All entries shall be made clearly in ink or typewritten. Amounts are to be shown in both words and figures. In case of discrepancy between the prices written in words and those written in figures, the amount shown in words shall govern. In the event there is a discrepancy between the unit prices and the total sum of all of the items (the computed contract price), the unit prices shall govern.

The above unit prices shall include all supervision, labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, bailing, shoring, removal, and all other things necessary to cover the finished work of the several kinds called for.

The Bidder understands that all bids for this project are subject to the applicable bidding laws of the Commonwealth of Massachusetts, including General Laws Chapter 30, Section 39M, as amended.

The contract will be awarded to the lowest responsible and eligible bidder.

The Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in the bidding.

The Bidder agrees that this bid shall be good and may not be withdrawn for a period of 30 days, Saturdays, Sundays and legal holidays excluded, after the opening of bids.

Within 10 days of receipt of the written notice of acceptance of this bid, the Bidder will execute the formal agreement attached in Section 00520, AGREEMENT.

Bid security is attached in the sum of five percent (5%) of the total bid in accordance with the conditions of Section 00200, INSTRUCTIONS TO BIDDERS. The bid security may become the property of the Owner in the event the contract and bond are not executed within the time set forth above.

The selected Contractor shall furnish a performance bond and a payment bond in an amount at least equal to one hundred percent (100%) of the contract prices in accordance with Section 00610, PERFORMANCE BOND, Section 00615, PAYMENT BOND, and as stipulated in Section 00700, GENERAL CONDITIONS of these specifications.

Form A - General Bid Form

[ATTACH this cover sheet to each **Bid Price Form** submitted. Note .. Company name and agent's initials are required on Each Bid Price Form.]

Item(s) #:

Description:

Addenda:

Company Name

Contact Person

Street

Phone

City, State, ZIP

Fax

e-mail (if any)

Submits the attached **Bid Price Form** as its bid pertaining to the Invitation for Bids and the specific Item(s) referenced above to the **Town of Arlington** on the authority of the undersigned and as dated below. The Bidder confirms and pledges to abide by and be held to the requirements of this IFB and its resulting Contract(s), and further, to diligently and promptly perform any tasks and deliver any documents required, and to execute a Contract the Town.

Authorized agent of the Bidder [If a corporation, attach certificate of vote or apply corporate seal to this page.]

* Affix Corporate Seal

Signature



Name

Title

Date

Form B – Non-Collusion Statement

Pursuant to M.G.L., Chapter 30, Section 39M, the undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this paragraph, the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

Authorized agent of the Bidder [If a corporation, attach certificate of vote or apply corporate seal to this page.]

X _____
Signature

Affix Corporate Seal



Name

Title

Date

Form B – Non-Collusion Statement

CERTIFICATE OF NON-COLLUSION

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation or other business or legal entity.

(Signature of individual submitting bid or proposal)

(Name of Business)

**NON-COLLUSION FORM
MUST BE SIGNED AND
SUBMITTED WITH BID**

Form C – Taxes Paid Certification

B. Requires Bidder Response

I certify, under the penalties of perjury that the below mentioned firm or person, to my best knowledge and belief, has complied with all the laws of the Commonwealth relating to taxes.

C. Name [as used for business tax filing] ↓

D. Business Address ↓

E. Phone * Fax * e-mail (if any)

Authorized agent of the Bidder [If a corporation, attach certificate of vote or apply corporate seal.]

X _____

* Affix Corporate Seal ↳

F. Signature



G. Name

H. Title

I. Date

J. Social Security # or Federal Identification

Approval of a contract or other agreement will not be granted unless the applicant signs this certification form.

Your Social Security Number or Federal Identification Number will be furnished to the Massachusetts Department of Revenue (DOR) to determine whether you have met tax filing or tax payment obligations. The Town is required to furnish a list to the DOR at the end of its fiscal year, showing the vendors to whom more than \$5,000 is paid during the 12 months ending June 30. Providers who fail to correct their non-filing or delinquency will not have a contract or other agreement issued, renewed, or extended. This request is made under the authority of Massachusetts General Laws, Chapter 62C, Section 49a, Certification Clause.

Form C – Taxes Paid Certification

CERTIFICATE OF STATE TAX COMPLIANCE

Pursuant to M.G.L. Chapter 62C, Section 49A, I certify under the penalties of perjury that I have complied with all laws of the commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

Social Security No. or
Federal Identification Number

Signature of Individual or Responsible
Corporate Office and Title

Form D – Certificate of OSHA Compliance

OSHA TRAINING REQUIREMENT

The undersigned hereby certifies that it is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that it will comply fully with all laws and regulations applicable to awards made subject to section forty-four A of Chapter 149 of the General Laws.

Signature

Title

Date

REFERENCE FORM

Bidder: _____

IFB Title: _____

Bidder must provide references for:

[Fill in the appropriate requirements: for example, all contracts performed within the past two (2) years of similar size and scope to this contract; or all current contracts where the vendor's equipment has been operational for at least two (2) years; or other requirements that define an appropriate reference pool.]

Reference: _____ Contact: _____

Address: _____ Phone: _____

Fax: _____

Description and date(s) of supplies or services provided:

Reference: [\[link\]](#) Contact: [\[link\]](#)

Address: _____ **Phone:** _____

Fax:

Description and date(s) of supplies or services provided:

References: [\[link\]](#) Contact: [\[link\]](#)

Address: _____ **Phone:** _____

Fax:

Description and date(s) of supplies or services provided:

Attach additional sheets if necessary.

SECTION 00520

AGREEMENT

THIS AGREEMENT, made this _____ day of _____, _____, by and between the Town of Arlington, Massachusetts, hereinafter called "OWNER," acting herein through its Town Manager, and doing business as (a corporation) (a limited liability company) (a partnership) (a joint venture) (an individual)* located in the (City) (Town)* of _____, County of _____, and State of _____, hereinafter called "CONTRACTOR."

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the OWNER, the CONTRACTOR hereby agrees with the OWNER to commence and complete the project described as follows:

MYSTIC STREET BRIDGE RECONSTRUCTIONPROJECT

INVITATION FOR BID 24-03

hereinafter called the project, for the sum of _____
Dollars and _____ Cents (\$_____) and all extra work in connection therewith, under the terms as stated in the Contract Documents; and at its own proper cost and expense to furnish superintendence, labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, bailing, shoring, removal, and all other things necessary to complete the said project in accordance with the conditions and prices stated in Section 00410, FORM OF GENERAL BID, Section 00700, GENERAL CONDITIONS, Section 00800, SUPPLEMENTARY CONDITIONS, Section 00830, STATE REGULATIONS, the plans, which include all maps, plates, drawings, blue prints, and the specifications and all other contract documents therefor as prepared by the Town of Arlington and Gill Engineering, including all bid documents.

The CONTRACTOR hereby agrees to commence work under this contract on or before a date to be fixed in the written Notice to Proceed given by the OWNER to the CONTRACTOR and to fully complete the contract duration for the Project. The CONTRACTOR further agrees to pay as liquidated damages the sum of \$1,700 for each consecutive calendar day thereafter during which the work has not been fully completed, as provided in the Liquidated Damages provisions of Section 00800, SUPPLEMENTARY CONDITIONS.

Minority-owned Business Enterprise (MBE), Women-owned Business Enterprise (WBE) and Equal Employment Opportunity polices of the Town of Arlington are applicable to this Contract. The Contractor shall comply with all applicable laws and regulations pertaining to nondiscrimination, equal opportunity and affirmative action, including without limitation executive orders and rules and regulations of federal and state agencies of competent jurisdiction. The Contractor shall make positive efforts to achieve: (1) a minority employee work force goal of 15.3 percent, (2) a woman employee work force goal of 6.90 percent, (3) a goal of 7.24

percent participation of Minority-owned Business Enterprise(s), and (4) a goal of 3.60 percent participation of Woman-owned Business Enterprise(s) within project contracts. At a minimum, the Contractor should allow MBEs and WBEs the maximum feasible opportunity to compete for subagreements to be performed under the project.

The CONTRACTOR shall not discriminate against or exclude any person from participation herein on grounds of race, color, religious creed, national origin, sex, sexual orientation, ancestry, or age; and that it shall take affirmative actions to insure that applicants are employed, and that employees are treated during their employment, without regard to race, color, religious creed, national origin, sex, sexual orientation, ancestry, age, or handicapped status.

The CONTRACTOR shall not participate in or cooperate with an international boycott, as defined in Section 999 (b)(3) and (4) of the Internal Revenue Code of 1986, as amended, or engage in conduct declared to be unlawful by Section 2 of Chapter 151E of the Massachusetts General Laws.

Applicable provisions of Massachusetts General Laws and Regulations and/or the United States Code and Code of Federal Regulations govern this Agreement and any provision in violation of the foregoing shall be deemed null, void and of no effect. Where conflict between Federal and State Laws and Regulations exists, the more stringent requirement shall apply.

Subject to G.L. c.30, sec. 39K and/or sec. 39G and G.L. c.30, sec. 39F, as applicable, the OWNER agrees to pay the CONTRACTOR in current funds for the performance of the Agreement, subject to additions and deductions, as provided in Section 00700, GENERAL CONDITIONS, and to make payments on account thereof as provided in Section 00700, GENERAL CONDITIONS and Section 00800, SUPPLEMENTARY CONDITIONS

In accordance with the requirements of G.L. c.149, §27B, the Contractor shall submit, and shall require all of its subcontractors required to keep a record of hours and wages paid to laborers employed on the project to submit, to the awarding authority on a weekly basis, copies of such records. All such weekly submissions shall be accompanied by the following certification:

The undersigned contractor hereby certifies, under the pains and penalties of perjury, that the foregoing payroll records are true and accurate records of the wages paid to laborers employed on the project for the period stated and said wages are in an amount no less than the prevailing wage rates established for the project by the Massachusetts Department of Labor and Workforce Development. The undersigned contractor agrees, in addition to any other remedies available to the awarding authority, to indemnify the awarding authority for, from and against any loss, expense, damages, actions or claims, including any expense incurred in connection with any delay or stoppage of the project work, arising out of or as a result of (1) the contractor's failure to pay laborers employed on the project the said applicable prevailing wage rates; (2) the failure of the foregoing payroll records to accurately state the said applicable prevailing wage rates; or (3) the failure of the foregoing payroll records to accurately represent the wages actually paid to laborers employed on the project.

IN WITNESS WHEREOF, the parties to these presents have executed this Agreement in six (6) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

AGREED:

Town of Arlington, Massachusetts
(Owner)

(Signature)

Jim Feeney
(Name)

Town Manager
(Title)

(Contractor)

By _____
(Name)

(Title)

(Address)

(City and State)

Approved as to Form:

By _____
(Owner's Counsel)

Michael Cunningham
(Name)

In accordance with M.G.L. C.44, Section 31C, this is to certify that an appropriation in the amount of this Contract is available therefor and that the Town of Arlington, Massachusetts has been authorized to execute the Contract and approve all requisitions and change orders.

By _____
(Owner's Accountant)

Ida Cody
(Name)

CERTIFICATE OF VOTE
(to be filed if Contractor is a Corporation)

I, _____, hereby certify that I am the duly qualified and acting Secretary of
(Secretary of Corporation)

and I further certify that a meeting of the Directors of said company,
(Name of Corporation)
duly called and held on _____, at which all members were present and voting, the
(Date of Meeting)
following vote was unanimously passed:

VOTED: To authorize and empower

Anyone acting singly, to execute Forms of General Bid, Contracts or Bonds on behalf
of the Corporation.

I further certify that the above vote is still in effect and has not been changed or
modified in any respect.

By: _____
(Secretary of Corporation)

A True Copy:

Attest: _____
(Notary Public)

My Commission Expires: _____
(Date)

Contractor's Certification

A Contractor will not be eligible for award of a contract unless such Contractor has submitted the following certification, which is deemed a part of the resulting contract:

CONTRACTOR'S CERTIFICATION

Name of the General Contractor

certifies that it:

1. Will not discriminate in their employment practices;
 2. Intends to use the following listed construction trades in the work under the contract:
-
-

and

3. Will make good faith efforts to comply with the minority employee and women employee workforce participation ratio goals and specific affirmative action steps contained herein; and
4. Is in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices; and
5. Will provide the provisions of the "Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program" to each and every subcontractor employed on the Project and will incorporate the terms of this Section into all subcontracts and work orders entered into on the Project.
6. Agrees to comply with all provisions contained herein.

Signature of authorized representative of Contractor

Date

Printed name of authorized representative of Contractor

SECTION 00550
NOTICE TO AWARD

TO: _____
(Company)

Project Description: **Bid 24-03 Mystic Street Bridge Reconstruction Project**

The Owner has reviewed and considered the Proposal for the above described Work submitted by you on _____ in response to the Invitation For Bids and Instructions to Bidders for the above referenced Project.

You are hereby notified that your Proposal has been accepted for Invitation For Bid in the amount totaling: \$_____.

You are required by the Instructions to Bidders to execute the Contract Agreement and furnish the required Payment Bond and certificates of insurance within ten (10) days from the date of this Notice of Award.

If you fail to execute said Agreement and to furnish said Bonds and Insurance within ten (10) days from the date of this Notice, said Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your Proposal as abandoned and as a forfeiture of your Bid Bond. The Owner will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this Notice To Award to the Owner.

Dated this _____ day of _____, 20____

By: _____
(Owner Signature)

(Name)

(Title)

ACCEPTANCE OF NOTICE AWARD

Receipt of this Notice To Award is hereby acknowledged, on this _____ day of _____, 20____.

By: _____
(Contractor Signature)

(Name)

(Title)

(Company)

SECTION 00560
NOTICE TO PROCEED

TO: _____
(Company)

DATE: _____

Project Description: **Bid 24-03 Mystic Street Bridge Reconstruction Project**

You are hereby notified to commence Work in accordance with the approved and endorsed Agreement on the _____ day of _____, 20____, for the above referenced project

Work shall commence as detailed in the Bid Documents and Agreement and shall fulfill all necessary requirements.

ACCEPTANCE OF NOTICE AWARD

Receipt of this Notice To Proceed is hereby acknowledged, on this _____ day of _____, 20____.

By: _____
(Contractor Signature)

(Name)

(Title)

(Company)

SECTION 00615
PAYMENT BOND

KNOW EVERYONE BY THESE PRESENTS: That we _____

(Name of Contractor)

a _____ hereinafter called "Principal" and

(Corporation, Partnership, Joint Venture, Limited Liability Company, or Individual)

_____ of _____, State of _____

(Surety)

(City)

(State)

hereinafter called "Surety" and licensed by the State Division of Insurance to do business under the laws of the Commonwealth of Massachusetts are held and firmly bound to the Town Arlington, Massachusetts, hereinafter called "Owner," in the penal sum of _____

_____ Dollars and _____

_____ Cents (\$_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal has entered into a certain contract with the Owner (the "Contract"), dated the ___ day of ___

_____, 20___, which Contract is by reference made a part hereof, for the construction described as follows:

**MYSTIC STREET BRIDGE RECONSTRUCTION PROJECT
INVITATION FOR BID 24-03**

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of this Contract or to the work or to the specifications. The Surety Company providing the bond shall have a rating of A or better within the Best Key Rating Guide.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

KNOW EVERYONE BY THESE PRESENTS: That we _____
(Name of Contractor)
a _____ hereinafter called "Principal" and
(Corporation, Partnership, Joint Venture, Limited Liability Company, or Individual)
of _____, State of _____
(Surety) (City) (State)

hereinafter called "Surety" and licensed by the State Division of Insurance to do business under the laws of the Commonwealth of Massachusetts are held and firmly bound to the Town Arlington, Massachusetts, hereinafter called "Owner," in the penal sum of _____ Dollars and _____ Cents (\$_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal has entered into a certain contract with the Owner (the "Contract"), dated the ___ day of ___, 20___, which Contract is by reference made a part hereof, for the construction described as follows:

MYSTIC STREET BRIDGE RECONSTRUCTION PROJECT

INVITATION FOR BID 24-03

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of this Contract or to the work or to the specifications. The Surety Company providing the bond shall have a rating of A or better within the Best Key Rating Guide.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

SECTION 00700

GENERAL CONDITIONS

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared By



Endorsed By



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1420 King Street, Alexandria, VA 22314-
2794

(703) 684-2882
www.nspe.org

American Council of Engineering Companies
1015 15th Street N.W., Washington, DC 20005
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www.asce.org

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1— DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
10. *Claim*
- a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the

- requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.
- b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.
 - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
 - d. A demand for money or services by a third party is not a Claim.
11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
 12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.
 13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
 14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
 15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
 16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
 17. *Cost of the Work*—See Paragraph 13.01 for definition.
 18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
 19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
 20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
 21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.
23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.
32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.
36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.
39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
46. *Technical Data*
 - a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
 - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
 - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
48. *Unit Price Work*—Work to be paid for on the basis of unit prices.
49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:* The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:* The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:* The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - 1. does not conform to the Contract Documents;
 - 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - 3. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
 - 1. The word “furnish,” when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 - 2. The word “install,” when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 - 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.
 - 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.

G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 Delivery of Performance and Payment Bonds; Evidence of Insurance

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. *Evidence of Owner’s Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 Copies of Documents

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 Before Starting Construction

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 2. a preliminary Schedule of Submittals; and
 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work

into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.
 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.
 4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 Intent

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- G. Nothing in the Contract Documents creates:
 - 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
 - 2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 Reference Standards

A. Standards Specifications, Codes, Laws and Regulations

- 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
- 2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility

inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 Requirements of the Contract Documents

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

**ARTICLE 4—
COMMENCEMENT AND
PROGRESS OF THE
WORK**

4.01 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the

established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 Progress Schedule

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
 2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 Delays in Contractor's Progress

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
 1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 2. Abnormal weather conditions;
 3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
 4. Acts of war or terrorism.

- D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:
 - 1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
 - 2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
 - 3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.
- E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:
 - 1. The circumstances that form the basis for the requested adjustment;
 - 2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
 - 3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
 - 4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
 - 5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.
- F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.
- G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 Availability of Lands

- A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

- 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 - 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment

and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 Subsurface and Physical Conditions

- A. *Reports and Drawings:* The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;
 2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and
 3. Technical Data contained in such reports and drawings.
- B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.
- C. *Reliance by Contractor on Technical Data:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.
- D. *Limitations of Other Data and Documents:* Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;
 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;
 3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or
 4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 Differing Subsurface or Physical Conditions

A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;
2. is of such a nature as to require a change in the Drawings or Specifications;
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

E. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in

Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;
 - b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice required by Paragraph 5.04.A.
 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.
- F. *Underground Facilities; Hazardous Environmental Conditions:* Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
 1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
 3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
 4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
 4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 Hazardous Environmental Conditions at Site

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
 2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures

- of construction to be employed by Contractor, and safety precautions and programs incident thereto;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 Performance, Payment, and Other Bonds

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Regulations, and must be issued and signed by a surety named in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual’s authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner’s termination rights under Article 16.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

- E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
- F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.
- H. Contractor shall require:
 - 1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and
 - 2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
- I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
- K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 Contractor's Insurance

- A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. *General Provisions:* The policies of insurance required by this Paragraph 6.03 as supplemented must:
 - 1. include at least the specific coverages required;
 - 2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;
 - 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;
 - 4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and
 - 5. include all necessary endorsements to support the stated requirements.
- C. *Additional Insureds:* The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
 - 1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;
 - 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;
 - 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and
5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

- A. *Builder's Risk:* Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur:* Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
- C. *Property Insurance for Substantially Complete Facilities:* Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

- A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against

Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
 2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.
1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 Receipt and Application of Property Insurance Proceeds

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

**ARTICLE 7—
CONTRACTOR'S
RESPONSIBILITIES**

7.01 Contractor's Means and Methods of Construction

- A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to
 - (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 Supervision and Superintendence

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 Labor; Working Hours

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 Services, Materials, and Equipment

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 "Or Equals"

- A. *Contractor's Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) has a proven record of performance and availability of responsive service; and
 - 4) is not objectionable to Owner.
- b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense:* Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or- equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer's Determination:* Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 Substitutes

- A. *Contractor's Request; Governing Criteria:* Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.
1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.
 2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:
 - a. will certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design;
 - 2) be similar in substance to the item specified; and
 - 3) be suited to the same use as the item specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from the item specified; and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
- C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

- E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 Concerning Subcontractors and Suppliers

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

- H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 Patent Fees and Royalties

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.09 Permits

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 Taxes

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.11 Laws and Regulations

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.
- C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 Record Documents

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.13 Safety and Protection

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
 - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.
 1. *Shop Drawings*
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.
 2. *Samples*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.
 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Engineer's Review of Shop Drawings and Samples*
 1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.
 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will

document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. Resubmittal Procedures for Shop Drawings and Samples

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.
2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:
 - a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.
 - b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.
 - c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

- d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.
 - 2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03, 2.04, and 2.05.
- F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 Contractor's General Warranty and Guarantee

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.
- B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:
 - 1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
 - 2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.
- C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
- D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:
 - 1. Observations by Engineer;
 - 2. Recommendation by Engineer or payment by Owner of any progress or final payment;
 - 3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 - 4. Use or occupancy of the Work or any part thereof by Owner;
 - 5. Any review and approval of a Shop Drawing or Sample submittal;
 - 6. The issuance of a notice of acceptability by Engineer;
 - 7. The end of the correction period established in Paragraph 15.08;
 - 8. Any inspection, test, or approval by others; or

9. Any correction of defective Work by Owner.
- E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 *Delegation of Professional Design Services*

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
 1. Checking for conformance with the requirements of this Paragraph 7.19;
 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 Other Work

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 Coordination

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 2. An itemization of the specific matters to be covered by such authority and responsibility; and
 3. The extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 Legal Relationships

- A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.
 - 1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.
 - 2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10— ENGINEER'S STATUS DURING CONSTRUCTION

10.01 Owner's Representative

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 Visits to Site

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 Resident Project Representative

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 Engineer's Authority

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 Amending and Supplementing the Contract

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (1) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 Change Orders

- A. Owner and Contractor shall execute appropriate Change Orders covering:
 1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and
 4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 Work Change Directives

- A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

- B. If Owner has issued a Work Change Directive and:
 - 1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
 - 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 Field Orders

- A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.
- B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 Owner-Authorized Changes in the Work

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.
- C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 Unauthorized Changes in the Work

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 Change of Contract Price

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:

1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
 3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit will be determined as follows:
1. A mutually acceptable fixed fee; or
 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
 - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
 - c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
 - d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
 - f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 Change of Contract Times

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 Change Proposals

- A. *Purpose and Content:* Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. Change Proposal Procedures

1. *Submittal:* Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.
2. *Supporting Data:* The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.
 - a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.
 - b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review:* Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.
4. *Engineer's Full Review and Action on the Change Proposal:* Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change

Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision:* Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- C. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.
- D. *Post-Completion:* Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 Notification to Surety

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 Claims

- A. *Claims Process:* The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:
 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;
 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and
 4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.
 - 3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval:* If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim:* If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results:* If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 Cost of the Work

- A. *Purposes for Determination of Cost of the Work:* The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 - 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included:* Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:
 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.
 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
 5. Other costs consisting of the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are

consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

- 1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

- 1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.
 - 2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price (“changed Work”), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded:* The term Cost of the Work does not include any of the following items:

- 1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
- 2. The cost of purchasing, renting, or furnishing small tools and hand tools.
- 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
- 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
- 5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
- 6. Expenses incurred in preparing and advancing Claims.
- 7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

- 1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
- 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

- E. *Documentation and Audit:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:* Contractor agrees that:
 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.
- C. *Owner's Contingency Allowance:* Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision

thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. Adjustments in Unit Price

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 Access to Work

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 Tests, Inspections, and Approvals

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 3. by manufacturers of equipment furnished under the Contract Documents;
 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.
- Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.
- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 Defective Work

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs,

losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 Acceptance of Defective Work

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 Uncovering Work

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 Owner May Stop the Work

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work,

or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 Owner May Correct Defective Work

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15— PAYMENTS TO CONTRACTOR; SET- OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments*
 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.
 2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the

Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work;
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;
 - d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. Payment Becomes Due

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. Reductions in Payment by Owner

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

- b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. The Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or
 - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 Contractor's Warranty of Title

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 Substantial Completion

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 Partial Use or Occupancy

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without

significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 Final Inspection

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 Final Payment

A. Application for Payment

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

- d. a list of all duly pending Change Proposals and Claims; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
- B. *Engineer's Review of Final Application and Recommendation of Payment:* If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.
- C. *Notice of Acceptability:* In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.
- D. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.
- E. *Final Payment Becomes Due:* Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 Waiver of Claims

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 Correction Period

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 1. correct the defective repairs to the Site or such adjacent areas;
 2. correct such defective Work;
 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 Owner May Suspend Work

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 Owner May Terminate for Cause

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);
 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects,

attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 Owner May Terminate for Convenience

- A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 Contractor May Stop Work or Terminate

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 Methods and Procedures

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and
 - 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;
 - 2. agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 Giving Notice

- A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
 - 1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
 - 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 - 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 Computation of Times

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 Cumulative Remedies

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 Limitation of Damages

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 No Waiver

- A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 Survival of Obligations

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 Controlling Law

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 Assignment of Contract

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 Successors and Assigns

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 Headings

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION 00800
SUPPLEMENTARY CONDITIONS
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SECTION 00800
SUPPLEMENTARY CONDITIONS

AMENDMENTS TO GENERAL CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC C-700, 2018 edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

ARTICLE 1. DEFINITIONS AND TERMINOLOGY

Delete the words "The individual or entity named as such in the Agreement" in 1.01.A.22 of the General Conditions, "Engineer", and insert the following in their place:

"The individual or entity duly appointed by the Owner to undertake the duties and powers herein assigned to the Engineer, acting either directly or through duly appointed representatives."

ARTICLE 2. PRELIMINARY MATTERS SC-2.02

Delete paragraph 2.02A of the General Conditions in its entirety. SC-2.03

Delete paragraph 2.03 A.3 of the General Conditions. SC-2.05

Delete paragraph 2.05 A.3 of the General Conditions.

ARTICLE 3. CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE SC-3.01

Add the following sentence at the end of Paragraph 3.01A of the General Conditions:

"...by all. Each and every provision of law and clause required by law to be inserted in these Contract Documents shall be deemed to be inserted herein, and they shall be read and enforced as though it were included herein, and if through mistake or otherwise, any such provision is not inserted, or if not correctly inserted, then upon the application of either party, the Contract Documents shall forthwith be physically amended to make such insertion."

SC-3.03

Delete the last phrase of paragraph 3.03 A.3 of the General Conditions starting with "had", and substitute the following:

"knew or reasonably should have known thereof."

ARTICLE 4. COMMENCEMENT AND PROGRESS OF THE WORK SC-4.01

Add a new paragraph immediately after paragraph 4.01A of the General Conditions which is to read as follows:

"B. Notwithstanding the time limitations provided in paragraph 4.01A, the OWNER may desire to commence the Contract Times later than the sixtieth day after the bid opening. The OWNER and CONTRACTOR, upon mutual agreement, may extend the commencement of the Contract Times to any date that they elect. OWNER must obtain CONTRACTOR's approval for extending the time beyond the dates/times stated in the Contract Documents."

SC-4.03

Add a new paragraph immediately after paragraph 4.03A of the General Conditions which is to read as follows:

"B. Engineer may check the lines, elevations and reference marks set by Contractor, and Contractor shall correct any errors disclosed by such check. Such a check shall not be considered as approval of Contractor's work and shall not relieve Contractor of the responsibility for construction of the entire Work in accordance with the Contract Documents. Contractor shall furnish personnel to assist Engineer in checking lines and grades."

SC-4.05

Delete Article 4.05A in its entirety and replace with the following:

"A. The Contractor hereby agrees that the Contractor shall have no claim for damages of any kind against the Owner or the Engineer on account of any delay in the commencement or performance of any of the work or any delay or suspension of any portion of the work, whether such delay is caused by the Owner, the Engineer, or otherwise except as provided for within the prevailing statutes. The Contractor acknowledges that the Contractor's sole remedy for any such delay and/or suspension will be an extension of time as provided in the Contract Documents. The Contractor will under no circumstances be eligible for additional compensation on account of any delay even if an extension of time is granted by the Owner.

Add the following to the paragraph that follows 4.05E.5:

" Accumulating the amount of time required to complete a series of additional work items or delays and adding this time to the original Contract Time will not be considered justification for an extension of time. To justify an extension of Contract Time, the Contractor must prove clearly and convincingly that the critical path for construction has been impacted by circumstances beyond the control of the Contractor and that the CPM schedule cannot be revised to eliminate the need for the requested time extension."

Add the following new paragraphs after paragraph 4.05G of the General Conditions: "4.06

Liquidated Damages:

- A. If the Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner the amount specified in the Contract, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contract shall be in default after the time stipulated in the Contract for completing the work. Such damages may be retained from time to time by the Owner from progress payments or any amounts owing to the Contractor, or otherwise collected.
- B. The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be retained from time to time by the Owner from current periodical estimates.
- C. It is further agreed that time is of the essence of each and every portion of this Contract and of the specifications wherein as definite and certain length of times if fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall

be of the essence of this Contract. Provided that the Contractor shall not be charged with liquidated damages of any excess cost when the Owner determines that the Contractor is without fault and the Contractor's reasons for the time extension are acceptable to the Owner; Provided, further, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:

- 1) to any preference, priority or allocation order duly issued by the Government;
- 2) to unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and severe weather; and
- 3) to any delays of subcontractors or suppliers occasioned by any of the causes specified in subsections C (1) and C (2) above;

D. Provided, further, that the Contractor shall, within thirty (30) days from the beginning of such delay, unless the Owner shall grant a further period of time prior to the date of final settlement of the Contract, notify the Owner, in writing, of the causes of the delay, who shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of its decision in the matter."

ARTICLE 5. SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.03

Delete the term "Supplementary Conditions" of paragraph 5.03A of the General Conditions and replace it with "Contract Documents".

Delete the term "Supplementary Conditions" of paragraph 5.03C line 2 of the General Conditions and replace it with "Contract Documents".

SC-5.05

Delete the following words from line 3 of paragraph 5.05 F.1 of the General Conditions: "...or was not shown or indicated with reasonable accuracy"

SC-5.06

Delete the term "Supplementary Conditions" in paragraph 5.06A of the General Conditions and replace it with "Contract Documents".

Add the following to the first sentence of paragraph 5.06C:

"or unless Contractor caused or contributed to such Hazardous Environmental Condition."

ARTICLE 6. BONDS AND INSURANCE

NOTICE TO CONTRACTOR:

1. Proof of Insurance coverage shall be furnished to the Owner in accordance with the schedule for submittal of Bonds and Agreements.
2. Additionally, refer to Article 2. PRELIMINARY MATTERS, Paragraph SC-2.01 B of the General Conditions.

SC-6.01

Insert these sentences following SC-6.01.A of the General Conditions:

"The Surety Company providing the bonds shall have a rating of A or better within the Best Key Rating Guide and be licensed by the Massachusetts Division of Insurance. The CONTRACTOR shall pay the premiums for such Bonds."

SC-6.02

"Delete paragraph 6.02D of the General Conditions in its entirety." Add the following paragraph to paragraph 6.02N:

"The Contractor shall immediately stop work on the Project and shall not resume work until the Contractor provides evidence, to the Owner and Engineer, in the form of an acceptable insurance certificate, of new insurance coverage that replaces all cancelled coverage that is required for the Project."

SC-6.03

Add the following paragraphs to SC-6.03B of the General Conditions:

6. If the aggregate limits of liability indicated in Contractor's insurance provided in accordance with paragraph 6.03 are not sufficient to cover all claims for damages arising from its operations under this Contract and from any other work performed by it or if the commercial general liability insurance policy of insurance does not provide that the general aggregate limits apply on a per project and per location basis, Contractor shall have the policy amended so that the aggregate limits of liability required by this Contract will be available to cover all claims for damages due to operations under this Contract.

7. Include by endorsement that the insurer shall waive all rights of subrogation in favor of the Owner, Engineer and any other party named in the written contract against whom the insurer must agree to waive rights of subrogation."

Insert "railroad protective liability" in line 2 of paragraph 6.03C.

Insert "except employer's liability" after the word "insureds" in line 1 of paragraph 6.03C.1.

Add the following paragraphs after 6.03C:

- D. *Workers' Compensation and Employer's Liability:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance, including, as applicable, United States Longshoreman and Harbor Workers' Compensation Act, Jones Act, stop-gap employer's liability coverage for monopolistic states, and foreign voluntary workers' compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

Workers' Compensation and Related Policies	licy limits of not less than:
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Jones Act (if applicable)	
Bodily injury by accident—each accident	\$N/A

Workers' Compensation and Related Policies	Policy limits of not less than:
Bodily injury by disease—aggregate	\$N/A
Employer's Liability	
Each accident	\$100,000
Each employee	\$100,000
Policy limit	\$500,000
Stop-gap Liability Coverage	
For work performed in monopolistic states, stop-gap liability coverage must be endorsed to either the worker's compensation or commercial general liability policy with a minimum limit of:	\$N/A

E. Commercial General Liability—Claims Covered: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:

1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,
2. damages insured by reasonably available personal injury liability coverage, and
3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

F. Commercial General Liability—Form and Content: Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage.
 - a. Such insurance must be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
4. Underground, explosion, and collapse coverage.
5. Personal injury coverage.
6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10, CG 20 33 and CG 20 37 or insurer's endorsement offering similar coverage. If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.
7. For design professional additional insureds, ISO Endorsement CG 20 32 or insurer's

endorsement offering similar coverage.

8. Independent Contractors Coverage.

G. Commercial General Liability—Excluded Content: The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:

1. Any modification of the standard definition of “insured contract” (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).
2. Any exclusion for water intrusion or water damage.
3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.
4. Any exclusion of coverage relating to earth subsidence or movement.
5. Any exclusion for the insured’s vicarious liability, strict liability, or statutory liability (other than worker’s compensation).
6. Any limitation or exclusion based on the nature of Contractor’s work.
7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

H. Commercial General Liability—Minimum Policy Limits

Commercial General Liability	Policy limits of not less than:
General Aggregate	\$2,000,000
Products—Completed Operations Aggregate	\$2,000,000
Personal and Advertising Injury	\$1,000,000
Bodily Injury and Property Damage—Each Occurrence	\$1,000,000

I. Automobile Liability: Contractor shall purchase and maintain automobile liability insurance for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy must be written on an occurrence basis.

Automobile Liability	Policy limits of not less than:
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	\$1,000,000

J. Umbrella or Excess Liability: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer’s liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

Excess or Umbrella Liability	Policy limits of not less than:

Each Occurrence	\$5,000,000
General Aggregate	\$5,000,000

- K. Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements: Contractor may meet the policy limits specified for employer's liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policy's policy limits and partial attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein. If such umbrella or excess liability policy was required under this Contract, at a specified minimum policy limit, such umbrella or excess policy must retain a minimum limits equivalent to those required in paragraph 6.03J after accounting for partial attribution of its limits to underlying policies, as allowed above.
- L. Contractor's Pollution Liability Insurance: Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance must be maintained for no less than three years after final completion.

Contractor's Pollution Liability	Policy limits of not less than:
Each Occurrence/Claim	\$2,000,000
General Aggregate	\$2,000,000

- M. Contractor's Professional Liability Insurance: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance must cover negligent acts, errors, or omissions in the performance of professional design or related services by the insured or others for whom the insured is legally liable. The insurance must be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. The retroactive date on the policy must pre-date the commencement of furnishing services on the Project.

Contractor's Professional Liability	Policy limits of not less than:
Each Claim	\$1,000,000
Annual Aggregate	\$1,000,000

- N. Railroad Protective Liability Insurance: Prior to commencing any Work within 50 feet of railroad-owned and controlled property, Contractor shall (1) endorse its commercial general liability policy with ISO CG 24 17, removing the contractual liability exclusion for work within 50 feet of a railroad, (2) purchase and maintain railroad protective liability insurance meeting the following requirements, (3) furnish a copy of the endorsement to Owner, and (4) submit a copy of the railroad protective policy and other railroad-required documentation to the railroad, and notify Owner of such submittal.

Railroad Protective Liability Insurance	Policy limits of not less than:
Each Claim	\$N/A

Aggregate	\$N/A
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- O. Unmanned Aerial Vehicle Liability Insurance: If Contractor uses unmanned aerial vehicles (UAV—commonly referred to as drones) at the Site or in support of any aspect of the Work, Contractor shall obtain UAV liability insurance in the amounts stated; name Owner, Engineer, and all individuals and entities identified in the Supplementary Conditions as additional insureds; and provide a certificate to Owner confirming Contractor's compliance with this requirement. Such insurance will provide coverage for property damage, bodily injury or death, and invasion of privacy.

Unmanned Aerial Vehicle Liability Insurance	Policy limits of not less than:
Each Claim	\$500,000
General Aggregate	\$1,000,000

SC-6.04

Delete Article 6.04 of the General Conditions in its entirety. SC-6.05

Amend the last sentence of paragraph 6.05A of the General Conditions by striking out the words "held by Owner or Contractor as trustee or fiduciary, or."

SC-6.07

Add the following paragraph 6.07 after paragraph 6.06 of the General Conditions:

"6.07 Owner's Objections to Contractor's Insurance Coverage

- A. If Owner has any objection to the coverage afforded by or other provisions of the insurance required to be purchased and maintained by Contractor in accordance with this Article 6 on the basis of its not complying with the Contract Documents, Owner will notify Contractor in writing thereof within thirty days of the date of delivery of such certificates to Owner in accordance with paragraph 6.02D. Contractor will provide such additional information in respect of insurance provided by him as Owner may reasonably request."

ARTICLE 7. CONTRACTOR'S RESPONSIBILITIES

SC-7.02

Delete paragraph 7.02B of the General Conditions in its entirety and replace with the following:

- "B. At the site of the Work the Contractor shall employ a full-time construction superintendent or foreman who shall have full authority to act for the Contractor. It is understood that such representative shall be acceptable to the Engineer and shall be one who will be continued in the capacity for the particular job involved unless the representative ceases to be on the Contractor's payroll. If at any time during the Work the representative is deemed by the Engineer to be no longer acceptable, the representative shall be promptly replaced by the Contractor. All communications to the superintendent or foreman shall be as binding as if given to the Contractor."

SC-7.08

Delete the second sentence in paragraph 7.08A of the General Conditions. SC-7.13

In line 3 of paragraph 7.13G of the General Conditions change "Supplementary Conditions"

to "Contract Documents".

SC-7.16

In paragraph 7.16C.1 of the General Conditions, delete the word "timely" from the first line. In paragraph 7.16E.1.b of the General Conditions, delete the word "timely" from the first line.

SC-7.18

Change the phrase "negligent act or omission" to "negligent or wrongful act or omission" in line 11 of paragraph 7.18A of the General Conditions.

Add the following to the end of paragraph 7.18A of the General Conditions:

"The Contractor hereby acknowledges its obligation under the foregoing paragraph to indemnify the Engineer and Owner against judgments suffered because of the Contractor's work and to assume the cost of defending the Engineer and Owner against claims as described in the foregoing paragraph."

ARTICLE 9. OWNER'S RESPONSIBILITIES

SC-9.02

Delete the phrase "provided Contractor makes no reasonable objection to the replacement engineer" in paragraph 9.02A of the General Conditions.

SC-9.06

Delete paragraph 9.06A of the General Conditions in its entirety.

SC-9.09

Insert the following after the first sentence of paragraph 9.09A of the General Conditions:
"However, the Owner shall have the right to direct the Contractor to perform the Work according to any sequence schedule set forth in the Contract Documents or established pursuant thereto."

ARTICLE 10. ENGINEER'S STATUS DURING CONSTRUCTION

SC-10.01

Add a new paragraph 10.01B after paragraph 10.01A of the General Conditions, which is to read as follows:

"B. Nothing contained in the Contract Documents shall be construed to create a contractual relationship of any kind (1) between the Engineer and Contractor, (2) between the Owner and a Subcontractor or Subcontractors, or (3) between any person or entities other than the Owner and Contractor. The Engineer shall, however, be entitled to performance and enforcement of obligations under the Contract Documents intended to facilitate performance of the Engineer's duties."

SC-10.02

Insert the following at the end of paragraph 10.02B of the General Conditions:

"However, the Engineer shall have the right to direct the Contractor to perform the Work according to any sequence schedule set forth in the Contract Documents or established pursuant thereto."

SC-10.03

Delete the last sentence of paragraph 10.03B.

SC-10.07

Insert the following after the first sentence of paragraph 10.07B of the General Conditions:

"However, the Engineer shall have the right to direct the Contractor to perform the Work according to any sequence schedule set forth in the Contract Documents or established pursuant thereto."

ARTICLE 13. COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

Delete Article 13 of the General Conditions in its entirety and replace with the following:

"A. The unit price of an item of Unit Price work shall be subject to reevaluation and adjustment under the following conditions:

- 1) If the total extended bid price [Estimated Quantity times the Bid Unit Price] of a particular item of Unit Price Work amounts to 5 percent or more of the Original Contract Price and the variation in the quantity of the particular item of Unit Price Work performed by Contractor differs by more than 15 percent from the estimated quantity of such item indicated in the Agreement; and
- 2) If there is no corresponding adjustment with respect to any other item of work; and
- 3) If Contractor believes that Contractor has incurred additional expense as a result thereof, Contractor may make a claim for an adjustment in the Contract Price in accordance with Article 12 if the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed. If Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, Owner shall be entitled to an adjustment in the unit price in an amount determined by the Engineer. Engineer shall not be liable in connection with any determination relating to adjustments which is rendered in good faith."

ARTICLE 14. TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

SC-14.03

Delete the word "Prompt" at the beginning of paragraph 14.03C of the General Conditions.

SC-14.07

Revise paragraph 14.07A of the General Conditions as follows:

A. Delete the word "seven" and replace it with the word "ten" so that it reads "after ten days' written notice to Contractor."

ARTICLE 15. PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

SC-15.01

Delete paragraph 15.01B.4 of the General Conditions and insert the following in its place:

"4. Retainage with respect to progress payments will be five percent or, if stipulated, the maximum allowed by law."

Delete the word "immediate" from line 2 of subparagraph 15.01E.2 of the General Conditions.

Delete subparagraph 15.01E.3 of the General Conditions in its entirety.

SC-15.02

Delete paragraph 15.02A in its entirety and insert the following in its place:

- "A. Contractor warrants and guarantees that title to all work, material and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than at the time of Application for Payment free and clear of all liens. Contractor shall provide written transfer of title and a certified paid invoice provided by the supplier."

SC-15.03

Delete the third sentence of paragraph 15.03C of the General conditions and replace it with the following:

"Owner shall review the preliminary certificate and make written objection to Engineer as to any provisions of the certificate or attached punch list."

In the same paragraph, delete the phrase "within 14 days after submission of the preliminary certificate to Owner" in the fourth sentence; delete the phrase "within said 14 days" in the fifth sentence.

SC-15.06

Delete from lines 5 and 6 of paragraph 15.06B of the General Conditions the phrase "within 10 days after receipt of the final Application for Payment," in the first sentence.

SC-15.08

Delete paragraph 15.08A of the General Conditions and insert the following in its place:

- "A. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any work is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions: (i) correct such defective work, or, if it has been rejected by Owner, remove it from the site and replace it with work that is not defective, and (ii) satisfactorily correct or remove and replace any damage to other work or the work of others therefrom. If Contractor does not begin the repairs within ten (10) days of receipt of written notification and promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk, loss or damage, Owner may have the defective work corrected or the rejected work removed and replaced, and all claims, costs, losses and damages caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor."

ARTICLE 16. SUSPENSION OF WORK AND TERMINATION SC-16.02

Add a new paragraph immediately after paragraph 16.02 A.4 of the General Conditions which is to read as follows:

- "5. If the Work to be done under this Contract shall be abandoned, or if this Contract or any part thereof shall be sublet, without the previous written consent of Owner, or if the contract or any claim thereunder shall be assigned by Contractor otherwise than as herein specified."

ARTICLE 18. MISCELLANEOUS SC-18.08

Replace paragraph 18.08A with the following:

- "A. The Contractor shall not assign the whole or any part of this Contract or any moneys due or to become due hereunder until thirty (30) days prior notice in writing has been given to the Owner of the intention to assign, which notice shall state the identity and address of the prospective assignee. No assignment shall be made without the Owner's prior written consent. Such consent shall not be unreasonably withheld. In case the Contractor assigns all or any part of the moneys due or to become due under this

Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to the Contractor shall be subject to prior claims of all persons, firms and corporations of services rendered or materials supplied for the performance of the work called for in this Contract."

SC-18.11, 18.12, 18.13, 18.14

Add the following new paragraphs after paragraph 18.10 of the General Conditions:

18.11 Liability

It is understood and agreed that members of the Owner or any agent or employees of the Owner signing this Agreement shall not be personally liable hereunder for any action incurred in connection with this Agreement.

18.12 State Statutes and Regulations

See Section 00830 of these Specifications for further modifications of the General Conditions due to state statutes and regulations.

18.13 Severability

If any provision of this Agreement shall be invalid or unenforceable to any extent or in any application, then the remainder of this Agreement and of such terms and conditions, except to such extent or in such application, shall not be affected thereby, and each and every term and condition of this Agreement shall be valid and enforced to the fullest extent and in the broadest application permitted by law."

END OF SECTION

SECTION 0830
STATE STATUTES AND REGULATIONS
COMMONWEALTH OF MASSACHUSETTS

K. REVISIONS TO GENERAL CONDITIONS

1. Definitions
2. Subsurface Conditions Found Different
3. Proprietary Specifications
4. Substitutions and "Or Equals" – Contractor's Expense
5. Subcontracting
6. Permits
7. Massachusetts Sales and Use Tax
8. Contractor Records
9. Engineer's Decisions on Requirements of Contract Documents and Acceptability of Work
10. Change of Contract Price
11. Payments
12. Suspension of Work and Termination
13. Special Requirements for Hazardous Wastes Contracts
14. Labor Classifications and Prevailing Wage Rates
15. Contractor's Surety

L. OTHER REGULATORY REQUIREMENTS

1. Working Hours
2. DEP Community Sound Level Criteria
3. OSHA 10 Hour Certification Requirements

ATTACHMENT A

Prevailing Wage Rates

ATTACHMENT B

Excerpts from Chapter 149, Chapter 30 and Chapter 82 of the Massachusetts General Law

ATTACHMENT C

Goals for Participation by Minority Business Enterprises (MBE) and Women Business Enterprises (WBE)

ATTACHMENT D

Change Orders

ATTACHMENT G

Commonwealth of Massachusetts Covid-19 Guidelines and Procedures for All Construction Sites and Workers

B. REVISIONS TO GENERAL CONDITIONS:

1. Definitions

The term "Awards Authority," as used herein, shall be considered to be synonymous with the term "Owner," described in definition 1.01 A.30.

Delete definition 1.01 A.42 entitled "Substantial Completion" in the General Conditions in its entirety and insert the following in its place:

"Substantial Completion shall be interpreted in accordance with Massachusetts General Law (MGL) c. 30, §39G or 39K as appropriate."

2. Subsurface Conditions Found Different

Add the following sentence to the end of paragraph 5.04A of the General Conditions:

"...to do so. Adjustments resulting from subsurface or latent physical conditions will be in accordance with MGL c. 30, §39N."

3. Proprietary Specifications

Revise the third sentence of Paragraph 7.05A of the General Conditions to read as follows:

"Unless the specification indicates that a proprietary item is called for, other items of material or equipment or material or equipment of other suppliers may be submitted to Engineer for review under the circumstances described below, and in accordance with MGL c. 30, §39M."

4. Substitutions and "Or Equals" – Contractor's Expense

Insert the following at the beginning of Paragraphs 7.05B and 7.06E of the General Conditions:

"Except as required by and indicated in the specifications and contract documents pursuant to MGL. c. 149, §44F,".

5. Subcontracting

Add the following language at the end of paragraph 7.06J of the General Conditions:

", except as required otherwise by MGL c. 149, §44F, for Work governed by MGL c. 149,
§44A through 44H."

6. Permits

Delete paragraph 7.09A of the General Conditions in its entirety and insert the following in its place:

"A. Unless otherwise provided for in Section 00890 PERMITS, the Awarding Authority shall be responsible for identifying and obtaining all federal, state, and local permits required by the nature and location of construction, including but not limited to railroad permits, building construction permits, and permits for street and highway cuts and openings. Contractor shall be responsible for obtaining all permits required of its equipment, work force, or particular operations (such as blasting) in the performance of the Work and not otherwise specified to be obtained by the Awarding Authority. These permit fees shall be paid by Contractor. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of bids, or, if there are no Bids, on the Effective Date of the Agreement."

7. Massachusetts Sales and Use Tax

Add the following paragraph after paragraph 7.10A of the General Conditions:

"B. The materials and supplies to be used by the Contractor in the Work of this Contract are exempt from the Sales and Use Tax of the Commonwealth of Massachusetts. The Awarding Authority tax exemption certificate number will be furnished to the Contractor."

8. Contractor Records

Add a new paragraph immediately after paragraph 7.11C of the General Conditions, which is to read as follows:

"D. The Contractor shall comply with all applicable provisions Chapter 30, Section 39R of the Massachusetts General Laws regarding, Contractor's records."

9. Engineer's Decisions on Requirements of Contract Documents and Acceptability of Work

Add the following language at the end of paragraph 10.06A of the General Conditions:
"The Engineer's interpretation will be made in accordance with the requirements of MGL c. 30, §39P."

10. Change of Contract Price

Delete paragraphs 11.07, 13.01, 13.02 and 13.03 of the General Conditions, having to do with Change of Contract Price. Changes in contract price will be governed by the section called "Change Orders," in Attachment D, Section 00830 and Article 13 in the Supplementary Conditions.

11. Payments

Add the following paragraph after Paragraph 15.01B.4 of the General Conditions:

"5. The Contractor shall submit Weekly Payroll Records Report and Statement of Compliance verifying compliance with the Minimum Prevailing Wage Law, MGL c. 149,

§26-27H. These Statements of Compliance shall be submitted as a condition of payment for work performed during the period the reports apply."

Delete paragraph 15.01C.1 of the General Conditions in its entirety and insert the following in its place:

"1. Progress Payments will be made in accordance with MGL c. 30, §39G, or §39K, as applicable."

Delete paragraph 15.01D.1 of the General Conditions in its entirety and replace it with the following:

"1. Payment shall be made in accordance with MGL c. 30, §39G, or §39K, as applicable." Add the following new paragraph following paragraph 15.01D.1 of the General Conditions:

"2. The Contractor shall make payments to Subcontractors in accordance with the requirements of MGL c. 30, §39F."

Delete paragraph 15.06B of the General Conditions in its entirety and insert the following in its place:

"Engineer's Review of Final Application and Recommendation of Payment: If, on the basis of the Engineer's observation of the Work during construction and final inspection and, upon the Engineer's review of the final Application for Payment and accompanying documentation, the Engineer is satisfied that the Work has been completed and that the Contractor's other obligations under the Contract Documents have been fulfilled, the Engineer will indicate in writing its recommendation of payment and present the Application to the Awarding Authority for payment. Thereupon the Engineer will give written notice to the Awarding Authority and the Contractor that the Work is acceptable subject to the provisions of paragraph 15.07. Otherwise, the Engineer will return the Application to Contractor, indicating in writing the reasons for refusing to recommend final payment. In such case the Contractor shall make the necessary corrections and resubmit the Application. If the Application and accompanying documentation are appropriate as to form and substance, the Awarding Authority shall in accordance with the applicable provisions of the Massachusetts General Laws, make payment to the Contractor."

Delete paragraph 15.06E of the General Conditions in its entirety and replace it with the following:

"1. Payment shall be made in accordance with MGL c. 30, §39G, or §39K, as applicable."

Delete paragraph 16.01A of the General Conditions in its entirety and insert the following in its place:

"A. The Awarding Authority may order, at any time and without cause, the Contractor to suspend or delay the Work in accordance with MGL c. 30, §39O."

13. Special Requirements for Hazardous Wastes Contracts

Add the following at the end of the first sentence of Paragraph 18.14 of the General Conditions:

", and to the "Rules and Regulations for the Prevention of Accidents in Construction Operations Chapter 454 CMR (Code of Massachusetts Regulations) 10.00 et seq."

14. Labor Classifications and Prevailing Wage Rates

Add the following paragraphs under the heading "Prevailing Wage Rates" after paragraph

18.14 of the Supplementary Conditions:

"18.15 Prevailing Wage Rates

2. Prevailing Wage Rates as determined by the Director of the Executive Office of Labor and Workforce Development under the provisions of MGL c. 149, §26-27H apply to this project. A copy of the wage schedule is included in Attachment A of Section 00830. If, after the Notice of Award, it becomes necessary to employ any person in a trade or occupation not classified in the wage determinations, such person shall be paid at not less than such rates as shall be determined by the Director. Such approved minimum rate shall be retroactive to the time of the initial employment of such person in such trade or occupation. The Contractor shall notify the Awarding Authority of its intention to employ persons in trades or occupations not classified in the wage determinations as soon as possible in order to allow sufficient time for the Awarding Authority to obtain approved rates for such trades or occupations.
3. The schedule of wages referred to above are minimum rates only, and the Awarding Authority will not consider any claims for additional compensation made by Contractor because of payment by the Contractor of any wage rate in excess of the applicable rate contained in the Contract.
4. The said schedule of wages shall continue to be the minimum rates to be paid during the life of this Agreement, except in the case of the duration of this Agreement exceeding one year, when the Contractor will be responsible for requesting and obtaining updated prevailing wage rates from the Owner before the one-year anniversary of the project's start date, and a legible copy of said schedule shall be kept posted in a conspicuous place at the site of the Work.
5. Contractor and subcontractors shall submit a copy of weekly payroll records to the Awarding Authority and the Awarding Authority shall retain the records for a minimum of three years."

15. Contractor's Surety

Add the following sentences at the end of paragraph 6.01A:

"The Surety Company providing the bonds shall have a rating of A or better within the Best Key Rating Guide and be licensed by the Massachusetts Division of Insurance. The Contractor shall pay the premiums for such Bonds."

C. OTHER REGULATORY REQUIREMENTS:

6. Working Hours

No laborer, workman, mechanic, foreman, or inspector, working within the Commonwealth, in the employ of the Contractor, subcontractor, or other person doing or contracting to do the whole or a part of the work contemplated by this contract, shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of emergency.

7. DEP Community Sound Level Criteria

The Community Sound Level Criteria as established by the Commonwealth of Massachusetts' Department of Environmental Protection (DEP) must be conformed to prior to the Awarding Authority's acceptance of the structure. The following sound level criteria must be met at the construction site:

- A. The increase in the broadband noise level shall not be in excess of ten (10) dB(A) above ambient at the station boundary. The ambient level is defined as the A-weighted noise level that is exceeded ninety (90) percent of the time measured during the period in question.
- B. The primary noise source(s) shall not produce a puretone condition. Puretone is any given octave band center frequency that exceeds the two adjacent center frequencies by three (3) or more decibels.

8. OSHA 10 Hour Certification Requirements

All employees of the Contractor who work at the jobsite must have received OSHA 10 Hour safety training, and have proof, at the jobsite, of being certified by OSHA as having received the training. The Contractor must provide written proof (copy of OSHA card each employee is required to carry is preferred) of this certification for every employee with submission of the first certified payroll report for each employee.



**THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS**

Prevailing Wage Rates

MAURA HEALEY
Governor

KIM DRISCOLL
Lt. Governor

**As determined by the Director under the provisions of the
Massachusetts General Laws, Chapter 149, Sections 26 to 27H**

LAUREN JONES
Secretary

MICHAEL FLANAGAN
Director

Awarding Authority: Town of Arlington

Contract Number:

City/Town: ARLINGTON

Description of Work: Phased removal and replacement of existing Mystic Street Bridge over Mill Brook. Work to include:
- Bridge Construction
- Site Work

Job Location: 0 Mystic Street (Mystic Street over Mill Brook)

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, the awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. The annual update requirement is not applicable to 27F "rental of equipment" contracts. **The updated wage schedule must be provided to all contractors, including general and sub-contractors, working on the construction project.**
- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or a sub-contractor.
- Apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentices must keep their apprentice identification card on their persons during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DAS regardless of whether they are registered with another federal, state, local, or private agency must be paid the journeyworker's rate.**
- Every contractor or subcontractor working on the construction project must submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. For a sample payroll reporting form go to <http://www.mass.gov/dols/pw>.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Contractors must obtain the wage schedules from awarding authorities. Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may file a complaint with the Fair Labor Division of the office of the Attorney General at (617) 727-3465.

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2023	\$40.05	\$14.41	\$18.67	\$0.00	\$73.13
	06/01/2024	\$41.05	\$14.41	\$18.67	\$0.00	\$74.13
	08/01/2024	\$41.05	\$14.91	\$18.67	\$0.00	\$74.63
	12/01/2024	\$41.05	\$14.91	\$20.17	\$0.00	\$76.13
	06/01/2025	\$42.05	\$14.91	\$20.17	\$0.00	\$77.13
	08/01/2025	\$42.05	\$15.41	\$20.17	\$0.00	\$77.63
	12/01/2025	\$42.05	\$15.41	\$21.78	\$0.00	\$79.24
	06/01/2026	\$43.05	\$15.41	\$21.78	\$0.00	\$80.24
	08/01/2026	\$43.05	\$15.91	\$21.78	\$0.00	\$80.74
	12/01/2026	\$43.05	\$15.91	\$23.52	\$0.00	\$82.48
(3 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2023	\$40.12	\$14.41	\$18.67	\$0.00	\$73.20
	06/01/2024	\$40.88	\$14.41	\$18.67	\$0.00	\$73.96
	08/01/2024	\$40.88	\$14.91	\$18.67	\$0.00	\$74.46
	12/01/2024	\$40.88	\$14.91	\$20.17	\$0.00	\$75.96
	06/01/2025	\$41.12	\$14.91	\$20.17	\$0.00	\$76.20
	08/01/2025	\$41.12	\$15.41	\$20.17	\$0.00	\$76.70
	12/01/2025	\$41.12	\$15.41	\$21.78	\$0.00	\$78.31
	06/01/2026	\$43.12	\$15.41	\$21.78	\$0.00	\$80.31
	08/01/2026	\$43.12	\$15.91	\$21.78	\$0.00	\$80.81
	12/01/2026	\$43.12	\$15.91	\$23.52	\$0.00	\$82.55
(4 & 5 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2023	\$40.24	\$14.41	\$18.67	\$0.00	\$73.32
	06/01/2024	\$41.24	\$14.41	\$18.67	\$0.00	\$74.32
	08/01/2024	\$41.24	\$14.91	\$18.67	\$0.00	\$74.82
	12/01/2024	\$41.24	\$14.91	\$20.17	\$0.00	\$76.32
	06/01/2025	\$42.24	\$14.91	\$20.17	\$0.00	\$77.32
	08/01/2025	\$42.24	\$15.41	\$20.17	\$0.00	\$77.82
	12/01/2025	\$42.24	\$15.41	\$21.78	\$0.00	\$79.43
	06/01/2026	\$43.24	\$15.41	\$21.78	\$0.00	\$80.43
	08/01/2026	\$43.24	\$15.91	\$21.78	\$0.00	\$80.93
	12/01/2026	\$43.24	\$15.91	\$23.52	\$0.00	\$82.67
ADS/SUBMERSIBLE PILOT <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$103.05	\$9.40	\$23.12	\$0.00	\$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2023	\$45.08	\$9.65	\$18.07	\$0.00	\$72.80
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2023	\$45.08	\$9.65	\$18.07	\$0.00	\$72.80
	06/01/2024	\$46.56	\$9.65	\$18.07	\$0.00	\$74.28
	12/01/2024	\$48.03	\$9.65	\$18.07	\$0.00	\$75.75
	06/01/2025	\$49.53	\$9.65	\$18.07	\$0.00	\$77.25
	12/01/2025	\$51.03	\$9.65	\$18.07	\$0.00	\$78.75
	06/01/2026	\$52.58	\$9.65	\$18.07	\$0.00	\$80.30
	12/01/2026	\$54.08	\$9.65	\$18.07	\$0.00	\$81.80
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</i>	12/01/2023 06/01/2024 12/01/2024 06/01/2025 12/01/2025	\$40.80 \$41.80 \$42.80 \$43.80 \$44.80	\$14.50 \$14.50 \$14.50 \$14.50 \$14.50	\$11.05 \$11.05 \$11.05 \$11.05 \$11.05	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$66.35 \$67.35 \$68.35 \$69.35 \$70.35
ASPHALT RAKER <i>LABORERS - ZONE 1</i>	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2023 06/01/2024 12/01/2024 06/01/2025 12/01/2025 06/01/2026 12/01/2026	\$44.58 \$46.06 \$47.53 \$49.03 \$50.53 \$52.08 \$53.58	\$9.65 \$9.65 \$9.65 \$9.65 \$9.65 \$9.65 \$9.65	\$18.07 \$18.07 \$18.07 \$18.07 \$18.07 \$18.07 \$18.07	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$72.30 \$73.78 \$75.25 \$76.75 \$78.25 \$79.80 \$81.30
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023 06/01/2024 12/01/2024 06/01/2025 12/01/2025 06/01/2026 12/01/2026	\$55.03 \$56.33 \$57.78 \$59.08 \$60.53 \$61.83 \$63.28	\$15.00 \$15.00 \$15.00 \$15.00 \$15.00 \$15.00 \$15.00	\$16.40 \$16.40 \$16.40 \$16.40 \$16.40 \$16.40 \$16.40	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$86.43 \$87.73 \$89.18 \$90.48 \$91.93 \$93.23 \$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023 06/01/2024 12/01/2024 06/01/2025 12/01/2025 06/01/2026 12/01/2026	\$55.03 \$56.33 \$57.78 \$59.08 \$60.53 \$61.83 \$63.28	\$15.00 \$15.00 \$15.00 \$15.00 \$15.00 \$15.00 \$15.00	\$16.40 \$16.40 \$16.40 \$16.40 \$16.40 \$16.40 \$16.40	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$86.43 \$87.73 \$89.18 \$90.48 \$91.93 \$93.23 \$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER <i>LABORERS - ZONE 1</i>	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER <i>LABORERS - ZONE 1</i>	12/01/2023	\$45.08	\$9.65	\$18.07	\$0.00	\$72.80
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2023 06/01/2024 12/01/2024 06/01/2025 12/01/2025 06/01/2026 12/01/2026	\$45.08 \$46.56 \$48.03 \$49.53 \$51.03 \$52.58 \$54.08	\$9.65 \$9.65 \$9.65 \$9.65 \$9.65 \$9.65 \$9.65	\$18.07 \$18.07 \$18.07 \$18.07 \$18.07 \$18.07 \$18.07	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$72.80 \$74.28 \$75.75 \$77.25 \$78.75 \$80.30 \$81.80
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
BOILER MAKER <i>BOILERMAKERS LOCAL 29</i>	01/01/2024	\$48.12	\$7.07	\$20.60	\$0.00	\$75.79

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - BOILERMAKER - Local 29

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	\$31.28	\$7.07	\$13.22	\$0.00	\$51.57
2	65	\$31.28	\$7.07	\$13.22	\$0.00	\$51.57
3	70	\$33.68	\$7.07	\$14.23	\$0.00	\$54.98
4	75	\$36.09	\$7.07	\$15.24	\$0.00	\$58.40
5	80	\$38.50	\$7.07	\$16.25	\$0.00	\$61.82
6	85	\$40.90	\$7.07	\$17.28	\$0.00	\$65.25
7	90	\$43.31	\$7.07	\$18.28	\$0.00	\$68.66
8	95	\$45.71	\$7.07	\$19.32	\$0.00	\$72.10

Notes:

Apprentice to Journeyworker Ratio:1:4

BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) <i>BRICKLAYERS LOCAL 3 (BOSTON)</i>	02/01/2024	\$62.40	\$11.49	\$23.59	\$0.00	\$97.48
	08/01/2024	\$64.50	\$11.49	\$23.59	\$0.00	\$99.58
	02/01/2025	\$65.80	\$11.49	\$23.59	\$0.00	\$100.88
	08/01/2025	\$67.95	\$11.49	\$23.59	\$0.00	\$103.03
	02/01/2026	\$69.30	\$11.49	\$23.59	\$0.00	\$104.38
	08/01/2026	\$71.50	\$11.49	\$23.59	\$0.00	\$106.58
	02/01/2027	\$72.90	\$11.49	\$23.59	\$0.00	\$107.98

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Boston

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$31.20	\$11.49	\$23.59	\$0.00	\$66.28
2	60	\$37.44	\$11.49	\$23.59	\$0.00	\$72.52
3	70	\$43.68	\$11.49	\$23.59	\$0.00	\$78.76
4	80	\$49.92	\$11.49	\$23.59	\$0.00	\$85.00
5	90	\$56.16	\$11.49	\$23.59	\$0.00	\$91.24

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$32.25	\$11.49	\$23.59	\$0.00	\$67.33
2	60	\$38.70	\$11.49	\$23.59	\$0.00	\$73.78
3	70	\$45.15	\$11.49	\$23.59	\$0.00	\$80.23
4	80	\$51.60	\$11.49	\$23.59	\$0.00	\$86.68
5	90	\$58.05	\$11.49	\$23.59	\$0.00	\$93.13

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$54.43	\$15.00	\$16.40	\$0.00	\$85.83
	06/01/2024	\$55.71	\$15.00	\$16.40	\$0.00	\$87.11
	12/01/2024	\$57.15	\$15.00	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.43	\$15.00	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.87	\$15.00	\$16.40	\$0.00	\$91.27
	06/01/2026	\$61.15	\$15.00	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.59	\$15.00	\$16.40	\$0.00	\$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

CAISSON & UNDERPINNING BOTTOM MAN <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2023	\$45.48	\$9.65	\$18.22	\$0.00	\$73.35
	06/01/2024	\$46.96	\$9.65	\$18.22	\$0.00	\$74.83
	12/01/2024	\$48.43	\$9.65	\$18.22	\$0.00	\$76.30
	06/01/2025	\$49.93	\$9.65	\$18.22	\$0.00	\$77.80
	12/01/2025	\$51.43	\$9.65	\$18.22	\$0.00	\$79.30
	06/01/2026	\$52.98	\$9.65	\$18.22	\$0.00	\$80.85
	12/01/2026	\$54.48	\$9.65	\$18.22	\$0.00	\$82.35

For apprentice rates see "Apprentice- LABORER"

CAISSON & UNDERPINNING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2023	\$44.33	\$9.65	\$18.22	\$0.00	\$72.20
	06/01/2024	\$45.81	\$9.65	\$18.22	\$0.00	\$73.68
	12/01/2024	\$47.28	\$9.65	\$18.22	\$0.00	\$75.15
	06/01/2025	\$48.78	\$9.65	\$18.22	\$0.00	\$76.65
	12/01/2025	\$50.28	\$9.65	\$18.22	\$0.00	\$78.15
	06/01/2026	\$51.83	\$9.65	\$18.22	\$0.00	\$79.70
	12/01/2026	\$53.33	\$9.65	\$18.22	\$0.00	\$81.20

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING TOP MAN <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2023	\$44.33	\$9.65	\$18.22	\$0.00	\$72.20
	06/01/2024	\$45.81	\$9.65	\$18.22	\$0.00	\$73.68
	12/01/2024	\$47.28	\$9.65	\$18.22	\$0.00	\$75.15
	06/01/2025	\$48.78	\$9.65	\$18.22	\$0.00	\$76.65
	12/01/2025	\$50.28	\$9.65	\$18.22	\$0.00	\$78.15
	06/01/2026	\$51.83	\$9.65	\$18.22	\$0.00	\$79.70
	12/01/2026	\$53.33	\$9.65	\$18.22	\$0.00	\$81.20
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
For apprentice rates see "Apprentice- LABORER"						
CARPENTER <i>CARPENTERS -ZONE 2 (Eastern Massachusetts)</i>	09/01/2023	\$45.87	\$9.83	\$19.97	\$0.00	\$75.67
	03/01/2024	\$47.12	\$9.83	\$19.97	\$0.00	\$76.92
	09/01/2024	\$48.37	\$9.83	\$19.97	\$0.00	\$78.17
	03/01/2025	\$49.62	\$9.83	\$19.97	\$0.00	\$79.42
	09/01/2025	\$50.87	\$9.83	\$19.97	\$0.00	\$80.67
	03/01/2026	\$52.12	\$9.83	\$19.97	\$0.00	\$81.92
	09/01/2026	\$53.37	\$9.83	\$19.97	\$0.00	\$83.17
	03/01/2027	\$54.62	\$9.83	\$19.97	\$0.00	\$84.42

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - CARPENTER - Zone 2 Eastern MA

Effective Date - 09/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.94	\$9.83	\$1.73	\$0.00	\$34.50
2	60	\$27.52	\$9.83	\$1.73	\$0.00	\$39.08
3	70	\$32.11	\$9.83	\$14.78	\$0.00	\$56.72
4	75	\$34.40	\$9.83	\$14.78	\$0.00	\$59.01
5	80	\$36.70	\$9.83	\$16.51	\$0.00	\$63.04
6	80	\$36.70	\$9.83	\$16.51	\$0.00	\$63.04
7	90	\$41.28	\$9.83	\$18.24	\$0.00	\$69.35
8	90	\$41.28	\$9.83	\$18.24	\$0.00	\$69.35

Effective Date - 03/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.56	\$9.83	\$1.73	\$0.00	\$35.12
2	60	\$28.27	\$9.83	\$1.73	\$0.00	\$39.83
3	70	\$32.98	\$9.83	\$14.78	\$0.00	\$57.59
4	75	\$35.34	\$9.83	\$14.78	\$0.00	\$59.95
5	80	\$37.70	\$9.83	\$16.51	\$0.00	\$64.04
6	80	\$37.70	\$9.83	\$16.51	\$0.00	\$64.04
7	90	\$42.41	\$9.83	\$18.24	\$0.00	\$70.48
8	90	\$42.41	\$9.83	\$18.24	\$0.00	\$70.48

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80

Step 1&2 \$32.20/ 3&4 \$38.76/ 5&6 \$58.45/ 7&8 \$64.77

Apprentice to Journeyworker Ratio:1:5

CARPENTER WOOD FRAME CARPENTERS-ZONE 3 (Wood Frame)	10/01/2023	\$25.55	\$7.02	\$4.80	\$0.00	\$37.37
	10/01/2024	\$26.65	\$7.02	\$4.80	\$0.00	\$38.47
	10/01/2025	\$27.75	\$7.02	\$4.80	\$0.00	\$39.57
	10/01/2026	\$28.85	\$7.02	\$4.80	\$0.00	\$40.67

All Aspects of New Wood Frame Work

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - CARPENTER (Wood Frame) - Zone 3

Effective Date - 10/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$15.33	\$7.02	\$0.00	\$0.00	\$22.35
2	60	\$15.33	\$7.02	\$0.00	\$0.00	\$22.35
3	65	\$16.61	\$7.02	\$1.00	\$0.00	\$24.63
4	70	\$17.89	\$7.02	\$1.00	\$0.00	\$25.91
5	75	\$19.16	\$7.02	\$4.80	\$0.00	\$30.98
6	80	\$20.44	\$7.02	\$4.80	\$0.00	\$32.26
7	85	\$21.72	\$7.02	\$4.80	\$0.00	\$33.54
8	90	\$23.00	\$7.02	\$4.80	\$0.00	\$34.82

Effective Date - 10/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$15.99	\$7.02	\$0.00	\$0.00	\$23.01
2	60	\$15.99	\$7.02	\$0.00	\$0.00	\$23.01
3	65	\$17.32	\$7.02	\$1.00	\$0.00	\$25.34
4	70	\$18.66	\$7.02	\$1.00	\$0.00	\$26.68
5	75	\$19.99	\$7.02	\$4.80	\$0.00	\$31.81
6	80	\$21.32	\$7.02	\$4.80	\$0.00	\$33.14
7	85	\$22.65	\$7.02	\$4.80	\$0.00	\$34.47
8	90	\$23.99	\$7.02	\$4.80	\$0.00	\$35.81

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80

Step 1&2 \$18.52/ 3&4 \$21.07/ 5&6 \$28.70/ 7&8 \$31.26

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING BRICKLAYERS LOCAL 3 (BOSTON)	01/01/2024	\$49.33	\$13.00	\$23.57	\$1.30	\$87.20
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Apprentice - CEMENT MASONRY/PLASTERING - Eastern Mass (Boston)

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.67	\$13.00	\$15.93	\$0.00	\$53.60
2	60	\$29.60	\$13.00	\$18.57	\$1.30	\$62.47
3	65	\$32.06	\$13.00	\$19.57	\$1.30	\$65.93
4	70	\$34.53	\$13.00	\$20.57	\$1.30	\$69.40
5	75	\$37.00	\$13.00	\$21.57	\$1.30	\$72.87
6	80	\$39.46	\$13.00	\$22.57	\$1.30	\$76.33
7	90	\$44.40	\$13.00	\$23.57	\$1.30	\$82.27

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CHAIN SAW OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$56.13	\$15.00	\$16.40	\$0.00	\$87.53
	06/01/2024	\$57.45	\$15.00	\$16.40	\$0.00	\$88.85
	12/01/2024	\$58.93	\$15.00	\$16.40	\$0.00	\$90.33
	06/01/2025	\$60.26	\$15.00	\$16.40	\$0.00	\$91.66
	12/01/2025	\$61.73	\$15.00	\$16.40	\$0.00	\$93.13
	06/01/2026	\$63.06	\$15.00	\$16.40	\$0.00	\$94.46
	12/01/2026	\$64.54	\$15.00	\$16.40	\$0.00	\$95.94
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$35.62	\$15.00	\$16.40	\$0.00	\$67.02
	06/01/2024	\$36.47	\$15.00	\$16.40	\$0.00	\$67.87
	12/01/2024	\$37.42	\$15.00	\$16.40	\$0.00	\$68.82
	06/01/2025	\$38.27	\$15.00	\$16.40	\$0.00	\$69.67
	12/01/2025	\$39.22	\$15.00	\$16.40	\$0.00	\$70.62
	06/01/2026	\$40.08	\$15.00	\$16.40	\$0.00	\$71.48
	12/01/2026	\$41.03	\$15.00	\$16.40	\$0.00	\$72.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DELEADER (BRIDGE) <i>PAINTERS LOCAL 35 - ZONE 2</i>	01/01/2024	\$56.06	\$9.95	\$23.95	\$0.00	\$89.96
	07/01/2024	\$57.26	\$9.95	\$23.95	\$0.00	\$91.16
	01/01/2025	\$58.46	\$9.95	\$23.95	\$0.00	\$92.36

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$28.03	\$9.95	\$0.00	\$0.00	\$37.98
2	55	\$30.83	\$9.95	\$6.66	\$0.00	\$47.44
3	60	\$33.64	\$9.95	\$7.26	\$0.00	\$50.85
4	65	\$36.44	\$9.95	\$7.87	\$0.00	\$54.26
5	70	\$39.24	\$9.95	\$20.32	\$0.00	\$69.51
6	75	\$42.05	\$9.95	\$20.93	\$0.00	\$72.93
7	80	\$44.85	\$9.95	\$21.53	\$0.00	\$76.33
8	90	\$50.45	\$9.95	\$22.74	\$0.00	\$83.14

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$28.63	\$9.95	\$0.00	\$0.00	\$38.58
2	55	\$31.49	\$9.95	\$6.66	\$0.00	\$48.10
3	60	\$34.36	\$9.95	\$7.26	\$0.00	\$51.57
4	65	\$37.22	\$9.95	\$7.87	\$0.00	\$55.04
5	70	\$40.08	\$9.95	\$20.32	\$0.00	\$70.35
6	75	\$42.95	\$9.95	\$20.93	\$0.00	\$73.83
7	80	\$45.81	\$9.95	\$21.53	\$0.00	\$77.29
8	90	\$51.53	\$9.95	\$22.74	\$0.00	\$84.22

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN LABORERS - ZONE 1	12/01/2023	\$44.48	\$9.65	\$18.07	\$0.00	\$72.20
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS - ZONE 1	12/01/2023	\$45.48	\$9.65	\$18.07	\$0.00	\$73.20
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS LABORERS - ZONE 1	12/01/2023	\$45.23	\$9.65	\$18.07	\$0.00	\$72.95
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER LABORERS - ZONE 1	12/01/2023	\$45.48	\$9.65	\$18.07	\$0.00	\$73.20
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR LABORERS - ZONE 1	12/01/2023	\$45.23	\$9.65	\$18.07	\$0.00	\$72.95
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER LABORERS - ZONE 1	12/01/2023	\$44.48	\$9.65	\$18.07	\$0.00	\$72.20
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DIRECTIONAL DRILL MACHINE OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$54.43	\$15.00	\$16.40	\$0.00	\$85.83
	06/01/2024	\$55.71	\$15.00	\$16.40	\$0.00	\$87.11
	12/01/2024	\$57.15	\$15.00	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.43	\$15.00	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.87	\$15.00	\$16.40	\$0.00	\$91.27
	06/01/2026	\$61.15	\$15.00	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.59	\$15.00	\$16.40	\$0.00	\$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$68.70	\$9.40	\$23.12	\$0.00	\$101.22
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$73.60	\$9.40	\$23.12	\$0.00	\$106.12
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2020	\$103.05	\$9.40	\$23.12	\$0.00	\$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) <i>DRAWBRIDGE - SEIU LOCAL 888</i>	07/01/2020	\$26.77	\$6.67	\$3.93	\$0.16	\$37.53
ELECTRICIAN <i>ELECTRICIANS LOCAL 103</i>	09/01/2023	\$61.39	\$13.00	\$21.69	\$0.00	\$96.08
	03/01/2024	\$61.86	\$13.00	\$22.21	\$0.00	\$97.07
	09/01/2024	\$63.78	\$13.00	\$22.26	\$0.00	\$99.04
	03/01/2025	\$64.98	\$13.00	\$22.30	\$0.00	\$100.28
	09/01/2025	\$66.89	\$13.00	\$22.36	\$0.00	\$102.25
	03/01/2026	\$68.09	\$13.00	\$22.39	\$0.00	\$103.48
	09/01/2026	\$70.00	\$13.00	\$22.45	\$0.00	\$105.45
	03/01/2027	\$71.19	\$13.00	\$22.49	\$0.00	\$106.68
	09/01/2027	\$73.11	\$13.00	\$22.54	\$0.00	\$108.65
	03/01/2028	\$74.31	\$13.00	\$22.58	\$0.00	\$109.89

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - ELECTRICIAN - Local 103

Effective Date - 09/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$24.56	\$13.00	\$0.74	\$0.00	\$38.30
2	40	\$24.56	\$13.00	\$0.74	\$0.00	\$38.30
3	45	\$27.63	\$13.00	\$16.16	\$0.00	\$56.79
4	45	\$27.63	\$13.00	\$16.16	\$0.00	\$56.79
5	50	\$30.70	\$13.00	\$16.66	\$0.00	\$60.36
6	55	\$33.76	\$13.00	\$17.16	\$0.00	\$63.92
7	60	\$36.83	\$13.00	\$17.67	\$0.00	\$67.50
8	65	\$39.90	\$13.00	\$18.17	\$0.00	\$71.07
9	70	\$42.97	\$13.00	\$18.67	\$0.00	\$74.64
10	75	\$46.04	\$13.00	\$19.18	\$0.00	\$78.22

Effective Date - 03/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$24.74	\$13.00	\$0.74	\$0.00	\$38.48
2	40	\$24.74	\$13.00	\$0.74	\$0.00	\$38.48
3	45	\$27.84	\$13.00	\$16.67	\$0.00	\$57.51
4	45	\$27.84	\$13.00	\$16.67	\$0.00	\$57.51
5	50	\$30.93	\$13.00	\$17.17	\$0.00	\$61.10
6	55	\$34.02	\$13.00	\$17.67	\$0.00	\$64.69
7	60	\$37.12	\$13.00	\$18.17	\$0.00	\$68.29
8	65	\$40.21	\$13.00	\$18.68	\$0.00	\$71.89
9	70	\$43.30	\$13.00	\$19.18	\$0.00	\$75.48
10	75	\$46.40	\$13.00	\$19.69	\$0.00	\$79.09

Notes:

App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR ELEVATOR CONSTRUCTORS LOCAL 4	01/01/2022	\$65.62	\$16.03	\$20.21	\$0.00	\$101.86
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Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - ELEVATOR CONSTRUCTOR - Local 4

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$32.81	\$16.03	\$0.00	\$0.00	\$48.84
2	55	\$36.09	\$16.03	\$20.21	\$0.00	\$72.33
3	65	\$42.65	\$16.03	\$20.21	\$0.00	\$78.89
4	70	\$45.93	\$16.03	\$20.21	\$0.00	\$82.17
5	80	\$52.50	\$16.03	\$20.21	\$0.00	\$88.74

Notes:

Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER <i>ELEVATOR CONSTRUCTORS LOCAL 4</i>	01/01/2022	\$45.93	\$16.03	\$20.21	\$0.00	\$82.17
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For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
	06/01/2024	\$46.06	\$9.65	\$18.07	\$0.00	\$73.78
	12/01/2024	\$47.53	\$9.65	\$18.07	\$0.00	\$75.25
	06/01/2025	\$49.03	\$9.65	\$18.07	\$0.00	\$76.75
	12/01/2025	\$50.53	\$9.65	\$18.07	\$0.00	\$78.25
	06/01/2026	\$52.08	\$9.65	\$18.07	\$0.00	\$79.80
	12/01/2026	\$53.58	\$9.65	\$18.07	\$0.00	\$81.30

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	11/01/2023	\$50.30	\$14.50	\$16.15	\$0.00	\$80.95
	05/01/2024	\$51.54	\$14.50	\$16.15	\$0.00	\$82.19
	11/01/2024	\$52.83	\$14.50	\$16.15	\$0.00	\$83.48
	05/01/2025	\$54.27	\$14.50	\$16.15	\$0.00	\$84.92
	11/01/2025	\$55.56	\$14.50	\$16.15	\$0.00	\$86.21
	05/01/2026	\$57.00	\$14.50	\$16.15	\$0.00	\$87.65
	11/01/2026	\$58.29	\$14.50	\$16.15	\$0.00	\$88.94
	05/01/2027	\$59.72	\$14.50	\$16.15	\$0.00	\$90.37

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	11/01/2023	\$51.87	\$14.50	\$16.15	\$0.00	\$82.52
	05/01/2024	\$53.12	\$14.50	\$16.15	\$0.00	\$83.77
	11/01/2024	\$54.42	\$14.50	\$16.15	\$0.00	\$85.07
	05/01/2025	\$55.87	\$14.50	\$16.15	\$0.00	\$86.52
	11/01/2025	\$57.17	\$14.50	\$16.15	\$0.00	\$87.82
	05/01/2026	\$58.62	\$14.50	\$16.15	\$0.00	\$89.27
	11/01/2026	\$59.92	\$14.50	\$16.15	\$0.00	\$90.57
	05/01/2027	\$61.37	\$14.50	\$16.15	\$0.00	\$92.02

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	11/01/2023	\$24.93	\$14.50	\$16.15	\$0.00	\$55.58
	05/01/2024	\$25.66	\$14.50	\$16.15	\$0.00	\$56.31
	11/01/2024	\$26.42	\$14.50	\$16.15	\$0.00	\$57.07
	05/01/2025	\$27.27	\$14.50	\$16.15	\$0.00	\$57.92
	11/01/2025	\$28.03	\$14.50	\$16.15	\$0.00	\$58.68
	05/01/2026	\$28.88	\$14.50	\$16.15	\$0.00	\$59.53
	11/01/2026	\$29.64	\$14.50	\$16.15	\$0.00	\$60.29
	05/01/2027	\$30.49	\$14.50	\$16.15	\$0.00	\$61.14
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER <i>ELECTRICIANS LOCAL 103</i>	09/01/2023	\$61.39	\$13.00	\$21.69	\$0.00	\$96.08
	03/01/2024	\$61.86	\$13.00	\$22.21	\$0.00	\$97.07
	09/01/2024	\$63.78	\$13.00	\$22.26	\$0.00	\$99.04
	03/01/2025	\$64.98	\$13.00	\$22.30	\$0.00	\$100.28
	09/01/2025	\$66.89	\$13.00	\$22.36	\$0.00	\$102.25
	03/01/2026	\$68.09	\$13.00	\$22.39	\$0.00	\$103.48
	09/01/2026	\$70.00	\$13.00	\$22.45	\$0.00	\$105.45
	03/01/2027	\$71.19	\$13.00	\$22.49	\$0.00	\$106.68
	09/01/2027	\$73.11	\$13.00	\$22.54	\$0.00	\$108.65
	03/01/2028	\$74.31	\$13.00	\$22.58	\$0.00	\$109.89
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING <i>ELECTRICIANS LOCAL 103</i>	09/01/2023	\$49.11	\$13.00	\$19.68	\$0.00	\$81.79
	03/01/2024	\$49.49	\$13.00	\$20.19	\$0.00	\$82.68
	09/01/2024	\$51.02	\$13.00	\$20.24	\$0.00	\$84.26
	03/01/2025	\$51.98	\$13.00	\$20.27	\$0.00	\$85.25
	09/01/2025	\$53.51	\$13.00	\$20.32	\$0.00	\$86.83
	03/01/2026	\$54.47	\$13.00	\$20.34	\$0.00	\$87.81
	09/01/2026	\$56.00	\$13.00	\$20.39	\$0.00	\$89.39
	03/01/2027	\$56.95	\$13.00	\$20.42	\$0.00	\$90.37
	09/01/2027	\$58.49	\$13.00	\$20.46	\$0.00	\$91.95
	03/01/2028	\$59.45	\$13.00	\$20.49	\$0.00	\$92.94
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$44.47	\$15.00	\$16.40	\$0.00	\$75.87
	06/01/2024	\$45.53	\$15.00	\$16.40	\$0.00	\$76.93
	12/01/2024	\$46.71	\$15.00	\$16.40	\$0.00	\$78.11
	06/01/2025	\$47.77	\$15.00	\$16.40	\$0.00	\$79.17
	12/01/2025	\$48.94	\$15.00	\$16.40	\$0.00	\$80.34
	06/01/2026	\$50.00	\$15.00	\$16.40	\$0.00	\$81.40
	12/01/2026	\$51.18	\$15.00	\$16.40	\$0.00	\$82.58
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2023	\$25.48	\$9.65	\$18.07	\$0.00	\$53.20
	06/01/2024	\$26.51	\$9.65	\$18.07	\$0.00	\$54.23
	12/01/2024	\$26.51	\$9.65	\$18.07	\$0.00	\$54.23
	06/01/2025	\$27.59	\$9.65	\$18.07	\$0.00	\$55.31
	12/01/2025	\$27.59	\$9.65	\$18.07	\$0.00	\$55.31
	06/01/2026	\$28.71	\$9.65	\$18.07	\$0.00	\$56.43
	12/01/2026	\$28.71	\$9.65	\$18.07	\$0.00	\$56.43
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FLOORCOVERER	09/01/2023	\$53.48	\$8.83	\$20.27	\$0.00	\$82.58
<i>FLOORCOVERERS LOCAL 2168 ZONE I</i>	03/01/2024	\$54.73	\$8.83	\$20.27	\$0.00	\$83.83
	09/01/2024	\$56.23	\$8.83	\$20.27	\$0.00	\$85.33
	03/01/2025	\$57.73	\$8.83	\$20.27	\$0.00	\$86.83
	09/01/2025	\$59.23	\$8.83	\$20.27	\$0.00	\$88.33
	03/01/2026	\$60.73	\$8.83	\$20.27	\$0.00	\$89.83
	09/01/2026	\$62.23	\$8.83	\$20.27	\$0.00	\$91.33
	03/01/2027	\$63.73	\$8.83	\$20.27	\$0.00	\$92.83

Apprentice - FLOORCOVERER - Local 2168 Zone I

Effective Date - 09/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.74	\$8.83	\$1.76	\$0.00	\$37.33
2	55	\$29.41	\$8.83	\$1.76	\$0.00	\$40.00
3	60	\$32.09	\$8.83	\$3.52	\$0.00	\$44.44
4	65	\$34.76	\$8.83	\$3.52	\$0.00	\$47.11
5	70	\$37.44	\$8.83	\$16.75	\$0.00	\$63.02
6	75	\$40.11	\$8.83	\$16.75	\$0.00	\$65.69
7	80	\$42.78	\$8.83	\$18.51	\$0.00	\$70.12
8	85	\$45.46	\$8.83	\$18.51	\$0.00	\$72.80

Effective Date - 03/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.37	\$8.83	\$1.76	\$0.00	\$37.96
2	55	\$30.10	\$8.83	\$1.76	\$0.00	\$40.69
3	60	\$32.84	\$8.83	\$3.52	\$0.00	\$45.19
4	65	\$35.57	\$8.83	\$3.52	\$0.00	\$47.92
5	70	\$38.31	\$8.83	\$16.75	\$0.00	\$63.89
6	75	\$41.05	\$8.83	\$16.75	\$0.00	\$66.63
7	80	\$43.78	\$8.83	\$18.51	\$0.00	\$71.12
8	85	\$46.52	\$8.83	\$18.51	\$0.00	\$73.86

Notes: Steps are 750 hrs.

% After 10/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)

Step 1&2 \$34.65/ 3&4 \$41.76/ 5&6 \$63.02/ 7&8 \$70.12

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER	12/01/2023	\$55.03	\$15.00	\$16.40	\$0.00	\$86.43
<i>OPERATING ENGINEERS LOCAL 4</i>	06/01/2024	\$56.33	\$15.00	\$16.40	\$0.00	\$87.73
	12/01/2024	\$57.78	\$15.00	\$16.40	\$0.00	\$89.18
	06/01/2025	\$59.08	\$15.00	\$16.40	\$0.00	\$90.48
	12/01/2025	\$60.53	\$15.00	\$16.40	\$0.00	\$91.93
	06/01/2026	\$61.83	\$15.00	\$16.40	\$0.00	\$93.23
	12/01/2026	\$63.28	\$15.00	\$16.40	\$0.00	\$94.68

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
GENERATOR/LIGHTING PLANT/HEATERS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$35.62	\$15.00	\$16.40	\$0.00	\$67.02
	06/01/2024	\$36.47	\$15.00	\$16.40	\$0.00	\$67.87
	12/01/2024	\$37.42	\$15.00	\$16.40	\$0.00	\$68.82
	06/01/2025	\$38.27	\$15.00	\$16.40	\$0.00	\$69.67
	12/01/2025	\$39.22	\$15.00	\$16.40	\$0.00	\$70.62
	06/01/2026	\$40.08	\$15.00	\$16.40	\$0.00	\$71.48
	12/01/2026	\$41.03	\$15.00	\$16.40	\$0.00	\$72.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) <i>GLAZIERS LOCAL 35 (ZONE 2)</i>	01/01/2024	\$45.56	\$9.95	\$23.95	\$0.00	\$79.46
	07/01/2024	\$46.76	\$9.95	\$23.95	\$0.00	\$80.66
	01/01/2025	\$47.96	\$9.95	\$23.95	\$0.00	\$81.86

Apprentice - GLAZIER - Local 35 Zone 2

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.78	\$9.95	\$0.00	\$0.00	\$32.73
2	55	\$25.06	\$9.95	\$6.66	\$0.00	\$41.67
3	60	\$27.34	\$9.95	\$7.26	\$0.00	\$44.55
4	65	\$29.61	\$9.95	\$7.87	\$0.00	\$47.43
5	70	\$31.89	\$9.95	\$20.32	\$0.00	\$62.16
6	75	\$34.17	\$9.95	\$20.93	\$0.00	\$65.05
7	80	\$36.45	\$9.95	\$21.53	\$0.00	\$67.93
8	90	\$41.00	\$9.95	\$22.74	\$0.00	\$73.69

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.38	\$9.95	\$0.00	\$0.00	\$33.33
2	55	\$25.72	\$9.95	\$6.66	\$0.00	\$42.33
3	60	\$28.06	\$9.95	\$7.26	\$0.00	\$45.27
4	65	\$30.39	\$9.95	\$7.87	\$0.00	\$48.21
5	70	\$32.73	\$9.95	\$20.32	\$0.00	\$63.00
6	75	\$35.07	\$9.95	\$20.93	\$0.00	\$65.95
7	80	\$37.41	\$9.95	\$21.53	\$0.00	\$68.89
8	90	\$42.08	\$9.95	\$22.74	\$0.00	\$74.77

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$55.03	\$15.00	\$16.40	\$0.00	\$86.43
	06/01/2024	\$56.33	\$15.00	\$16.40	\$0.00	\$87.73
	12/01/2024	\$57.78	\$15.00	\$16.40	\$0.00	\$89.18
	06/01/2025	\$59.08	\$15.00	\$16.40	\$0.00	\$90.48
	12/01/2025	\$60.53	\$15.00	\$16.40	\$0.00	\$91.93
	06/01/2026	\$61.83	\$15.00	\$16.40	\$0.00	\$93.23
	12/01/2026	\$63.28	\$15.00	\$16.40	\$0.00	\$94.68

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - OPERATING ENGINEERS - Local 4

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$30.27	\$15.00	\$0.00	\$0.00	\$45.27
2	60	\$33.02	\$15.00	\$16.40	\$0.00	\$64.42
3	65	\$35.77	\$15.00	\$16.40	\$0.00	\$67.17
4	70	\$38.52	\$15.00	\$16.40	\$0.00	\$69.92
5	75	\$41.27	\$15.00	\$16.40	\$0.00	\$72.67
6	80	\$44.02	\$15.00	\$16.40	\$0.00	\$75.42
7	85	\$46.78	\$15.00	\$16.40	\$0.00	\$78.18
8	90	\$49.53	\$15.00	\$16.40	\$0.00	\$80.93

Effective Date - 06/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$30.98	\$15.00	\$0.00	\$0.00	\$45.98
2	60	\$33.80	\$15.00	\$16.40	\$0.00	\$65.20
3	65	\$36.61	\$15.00	\$16.40	\$0.00	\$68.01
4	70	\$39.43	\$15.00	\$16.40	\$0.00	\$70.83
5	75	\$42.25	\$15.00	\$16.40	\$0.00	\$73.65
6	80	\$45.06	\$15.00	\$16.40	\$0.00	\$76.46
7	85	\$47.88	\$15.00	\$16.40	\$0.00	\$79.28
8	90	\$50.70	\$15.00	\$16.40	\$0.00	\$82.10

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 17 - A	02/01/2024	\$57.86	\$14.43	\$27.07	\$2.93	\$102.29
	08/01/2024	\$59.61	\$14.43	\$27.07	\$2.93	\$104.04
	02/01/2025	\$61.36	\$14.43	\$27.07	\$2.93	\$105.79
	08/01/2025	\$63.21	\$14.43	\$27.07	\$2.93	\$107.64
	02/01/2026	\$65.16	\$14.43	\$27.07	\$2.93	\$109.59

For apprentice rates see "Apprentice- SHEET METAL WORKER"

HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 103	09/01/2023	\$61.39	\$13.00	\$21.69	\$0.00	\$96.08
	03/01/2024	\$61.86	\$13.00	\$22.21	\$0.00	\$97.07
	09/01/2024	\$63.78	\$13.00	\$22.26	\$0.00	\$99.04
	03/01/2025	\$64.98	\$13.00	\$22.30	\$0.00	\$100.28
	09/01/2025	\$66.89	\$13.00	\$22.36	\$0.00	\$102.25
	03/01/2026	\$68.09	\$13.00	\$22.39	\$0.00	\$103.48
	09/01/2026	\$70.00	\$13.00	\$22.45	\$0.00	\$105.45
	03/01/2027	\$71.19	\$13.00	\$22.49	\$0.00	\$106.68
	09/01/2027	\$73.11	\$13.00	\$22.54	\$0.00	\$108.65
	03/01/2028	\$74.31	\$13.00	\$22.58	\$0.00	\$109.89

For apprentice rates see "Apprentice- ELECTRICIAN"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING - AIR) <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	02/01/2024 08/01/2024 02/01/2025 08/01/2025 02/01/2026	\$57.86 \$59.61 \$61.36 \$63.21 \$65.16	\$14.43 \$14.43 \$14.43 \$14.43 \$14.43	\$27.07 \$27.07 \$27.07 \$27.07 \$27.07	\$2.93 \$2.93 \$2.93 \$2.93 \$2.93	\$102.29 \$104.04 \$105.79 \$107.64 \$109.59
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) <i>PIPEFITTERS LOCAL 537</i>	09/01/2023 03/01/2024 09/01/2024 03/01/2025	\$63.48 \$65.28 \$67.08 \$68.88	\$12.70 \$12.70 \$12.70 \$12.70	\$21.50 \$21.50 \$21.50 \$21.50	\$0.00 \$0.00 \$0.00 \$0.00	\$97.68 \$99.48 \$101.28 \$103.08
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC <i>PIPEFITTERS LOCAL 537</i>	09/01/2023 03/01/2024 09/01/2024 03/01/2025	\$63.48 \$65.28 \$67.08 \$68.88	\$12.70 \$12.70 \$12.70 \$12.70	\$21.50 \$21.50 \$21.50 \$21.50	\$0.00 \$0.00 \$0.00 \$0.00	\$97.68 \$99.48 \$101.28 \$103.08
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS <i>LABORERS - ZONE 1</i>	12/01/2023	\$45.08	\$9.65	\$18.07	\$0.00	\$72.80
For apprentice rates see "Apprentice- LABORER"						
HYDRAULIC DRILLS (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2023 06/01/2024 12/01/2024 06/01/2025 12/01/2025 06/01/2026 12/01/2026	\$45.08 \$46.56 \$48.03 \$49.53 \$51.03 \$52.58 \$54.08	\$9.65 \$9.65 \$9.65 \$9.65 \$9.65 \$9.65 \$9.65	\$18.07 \$18.07 \$18.07 \$18.07 \$18.07 \$18.07 \$18.07	\$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00 \$0.00	\$72.80 \$74.28 \$75.75 \$77.25 \$78.75 \$80.30 \$81.80
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
INSULATOR (PIPES & TANKS) <i>HEAT & FROST INSULATORS LOCAL 6 (BOSTON)</i>	09/01/2023 09/01/2024 09/01/2025 09/01/2026	\$53.50 \$56.92 \$60.34 \$63.76	\$14.75 \$14.75 \$14.75 \$14.75	\$19.61 \$19.61 \$19.61 \$19.61	\$0.00 \$0.00 \$0.00 \$0.00	\$87.86 \$91.28 \$94.70 \$98.12

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston

Effective Date - 09/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.75	\$14.75	\$14.32	\$0.00	\$55.82
2	60	\$32.10	\$14.75	\$15.37	\$0.00	\$62.22
3	70	\$37.45	\$14.75	\$16.43	\$0.00	\$68.63
4	80	\$42.80	\$14.75	\$17.49	\$0.00	\$75.04

Effective Date - 09/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$28.46	\$14.75	\$14.32	\$0.00	\$57.53
2	60	\$34.15	\$14.75	\$15.37	\$0.00	\$64.27
3	70	\$39.84	\$14.75	\$16.43	\$0.00	\$71.02
4	80	\$45.54	\$14.75	\$17.49	\$0.00	\$77.78

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER IRONWORKERS LOCAL 7 (BOSTON AREA)	03/16/2023	\$52.72	\$8.35	\$26.70	\$0.00	\$87.77
	03/16/2024	\$53.97	\$8.35	\$26.70	\$0.00	\$89.02

Apprentice - IRONWORKER - Local 7 Boston

Effective Date - 03/16/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$31.63	\$8.35	\$26.70	\$0.00	\$66.68
2	70	\$36.90	\$8.35	\$26.70	\$0.00	\$71.95
3	75	\$39.54	\$8.35	\$26.70	\$0.00	\$74.59
4	80	\$42.18	\$8.35	\$26.70	\$0.00	\$77.23
5	85	\$44.81	\$8.35	\$26.70	\$0.00	\$79.86
6	90	\$47.45	\$8.35	\$26.70	\$0.00	\$82.50

Effective Date - 03/16/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$32.38	\$8.35	\$26.70	\$0.00	\$67.43
2	70	\$37.78	\$8.35	\$26.70	\$0.00	\$72.83
3	75	\$40.48	\$8.35	\$26.70	\$0.00	\$75.53
4	80	\$43.18	\$8.35	\$26.70	\$0.00	\$78.23
5	85	\$45.87	\$8.35	\$26.70	\$0.00	\$80.92
6	90	\$48.57	\$8.35	\$26.70	\$0.00	\$83.62

Notes:

Apprentice to Journeyworker Ratio:1:4

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
JACKHAMMER & PAVING BREAKER OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30

For apprentice rates see "Apprentice- LABORER"

LABORER <i>LABORERS - ZONE 1</i>	12/01/2023	\$44.33	\$9.65	\$18.07	\$0.00	\$72.05
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Apprentice - LABORER - Zone 1

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$26.60	\$9.65	\$18.07	\$0.00	\$54.32
2	70	\$31.03	\$9.65	\$18.07	\$0.00	\$58.75
3	80	\$35.46	\$9.65	\$18.07	\$0.00	\$63.18
4	90	\$39.90	\$9.65	\$18.07	\$0.00	\$67.62

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2023	\$44.33	\$9.65	\$18.07	\$0.00	\$72.05
	06/01/2024	\$45.81	\$9.65	\$18.07	\$0.00	\$73.53
	12/01/2024	\$47.28	\$9.65	\$18.07	\$0.00	\$75.00
	06/01/2025	\$48.78	\$9.65	\$18.07	\$0.00	\$76.50
	12/01/2025	\$50.28	\$9.65	\$18.07	\$0.00	\$78.00
	06/01/2026	\$51.83	\$9.65	\$18.07	\$0.00	\$79.55
	12/01/2026	\$53.33	\$9.65	\$18.07	\$0.00	\$81.05

Apprentice - LABORER (Heavy & Highway) - Zone 1

Effective Date - 12/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$26.60	\$9.65	\$18.07	\$0.00	\$54.32
2	70	\$31.03	\$9.65	\$18.07	\$0.00	\$58.75
3	80	\$35.46	\$9.65	\$18.07	\$0.00	\$63.18
4	90	\$39.90	\$9.65	\$18.07	\$0.00	\$67.62

Effective Date - 06/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$27.49	\$9.65	\$18.07	\$0.00	\$55.21
2	70	\$32.07	\$9.65	\$18.07	\$0.00	\$59.79
3	80	\$36.65	\$9.65	\$18.07	\$0.00	\$64.37
4	90	\$41.23	\$9.65	\$18.07	\$0.00	\$68.95

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: CARPENTER TENDER <i>LABORERS - ZONE 1</i>	12/01/2023	\$44.33	\$9.65	\$18.07	\$0.00	\$72.05
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER <i>LABORERS - ZONE 1</i>	12/01/2023	\$44.33	\$9.65	\$18.07	\$0.00	\$72.05
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER <i>LABORERS - ZONE 1</i>	12/01/2023	\$44.48	\$9.65	\$18.07	\$0.00	\$72.20
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER <i>LABORERS - ZONE 1</i>	06/01/2023	\$43.83	\$9.40	\$17.82	\$0.00	\$71.05
06/01/2024 \$44.58 \$9.65 \$18.07 \$0.00 \$72.30						
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
06/01/2024 \$46.06 \$9.65 \$18.07 \$0.00 \$73.78						
12/01/2024 \$47.53 \$9.65 \$18.07 \$0.00 \$75.25						
06/01/2025 \$49.03 \$9.65 \$18.07 \$0.00 \$76.75						
12/01/2025 \$50.53 \$9.65 \$18.07 \$0.00 \$78.25						
06/01/2026 \$52.08 \$9.65 \$18.07 \$0.00 \$79.80						
12/01/2026 \$53.58 \$9.65 \$18.07 \$0.00 \$81.30						
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
LABORER: MULTI-TRADE TENDER <i>LABORERS - ZONE 1</i>	12/01/2023	\$44.33	\$9.65	\$18.07	\$0.00	\$72.05
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER <i>LABORERS - ZONE 1</i>	12/01/2023	\$44.33	\$9.65	\$18.07	\$0.00	\$72.05
This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
06/01/2024 \$46.06 \$9.65 \$18.07 \$0.00 \$73.78						
12/01/2024 \$47.53 \$9.65 \$18.07 \$0.00 \$75.25						
06/01/2025 \$49.03 \$9.65 \$18.07 \$0.00 \$76.75						
12/01/2025 \$50.53 \$9.65 \$18.07 \$0.00 \$78.25						
06/01/2026 \$52.08 \$9.65 \$18.07 \$0.00 \$79.80						
12/01/2026 \$53.58 \$9.65 \$18.07 \$0.00 \$81.30						
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
MARBLE & TILE FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	02/01/2024	\$47.89	\$11.49	\$21.37	\$0.00	\$80.75
08/01/2024 \$49.57 \$11.49 \$21.37 \$0.00 \$82.43						
02/01/2025 \$50.61 \$11.49 \$21.37 \$0.00 \$83.47						
08/01/2025 \$52.33 \$11.49 \$21.37 \$0.00 \$85.19						
02/01/2026 \$53.41 \$11.49 \$21.37 \$0.00 \$86.27						
08/01/2026 \$55.17 \$11.49 \$21.37 \$0.00 \$88.03						
02/01/2027 \$56.29 \$11.49 \$21.37 \$0.00 \$89.15						

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - MARBLE & TILE FINISHER - Local 3 Marble & Tile

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.95	\$11.49	\$21.37	\$0.00	\$56.81
2	60	\$28.73	\$11.49	\$21.37	\$0.00	\$61.59
3	70	\$33.52	\$11.49	\$21.37	\$0.00	\$66.38
4	80	\$38.31	\$11.49	\$21.37	\$0.00	\$71.17
5	90	\$43.10	\$11.49	\$21.37	\$0.00	\$75.96

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.79	\$11.49	\$21.37	\$0.00	\$57.65
2	60	\$29.74	\$11.49	\$21.37	\$0.00	\$62.60
3	70	\$34.70	\$11.49	\$21.37	\$0.00	\$67.56
4	80	\$39.66	\$11.49	\$21.37	\$0.00	\$72.52
5	90	\$44.61	\$11.49	\$21.37	\$0.00	\$77.47

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS,TILELAYERS & TERRAZZO MECH BRICKLAYERS LOCAL 3 - MARBLE & TILE	02/01/2024	\$62.42	\$11.49	\$23.56	\$0.00	\$97.47
	08/01/2024	\$64.52	\$11.49	\$23.56	\$0.00	\$99.57
	02/01/2025	\$65.82	\$11.49	\$23.56	\$0.00	\$100.87
	08/01/2025	\$67.97	\$11.49	\$23.56	\$0.00	\$103.02
	02/01/2026	\$69.32	\$11.49	\$23.56	\$0.00	\$104.37
	08/01/2026	\$71.52	\$11.49	\$23.56	\$0.00	\$106.57
	02/01/2027	\$72.92	\$11.49	\$23.56	\$0.00	\$107.97

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$31.21	\$11.49	\$23.56	\$0.00	\$66.26
2	60	\$37.45	\$11.49	\$23.56	\$0.00	\$72.50
3	70	\$43.69	\$11.49	\$23.56	\$0.00	\$78.74
4	80	\$49.94	\$11.49	\$23.56	\$0.00	\$84.99
5	90	\$56.18	\$11.49	\$23.56	\$0.00	\$91.23

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$32.26	\$11.49	\$23.56	\$0.00	\$67.31
2	60	\$38.71	\$11.49	\$23.56	\$0.00	\$73.76
3	70	\$45.16	\$11.49	\$23.56	\$0.00	\$80.21
4	80	\$51.62	\$11.49	\$23.56	\$0.00	\$86.67
5	90	\$58.07	\$11.49	\$23.56	\$0.00	\$93.12

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$54.43	\$15.00	\$16.40	\$0.00	\$85.83
	06/01/2024	\$55.71	\$15.00	\$16.40	\$0.00	\$87.11
	12/01/2024	\$57.15	\$15.00	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.43	\$15.00	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.87	\$15.00	\$16.40	\$0.00	\$91.27
	06/01/2026	\$61.15	\$15.00	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.59	\$15.00	\$16.40	\$0.00	\$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MECHANICS MAINTENANCE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$54.43	\$15.00	\$16.40	\$0.00	\$85.83
	06/01/2024	\$55.71	\$15.00	\$16.40	\$0.00	\$87.11
	12/01/2024	\$57.15	\$15.00	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.43	\$15.00	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.87	\$15.00	\$16.40	\$0.00	\$91.27
	06/01/2026	\$61.15	\$15.00	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.59	\$15.00	\$16.40	\$0.00	\$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MILLWRIGHT (Zone 1) <i>MILLWRIGHTS LOCAL 1121 - Zone 1</i>	01/02/2023	\$47.27	\$8.58	\$21.57	\$0.00	\$77.42
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Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Apprentice - MILLWRIGHT - Local 1121 Zone 1							
Effective Date - 01/02/2023							
Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	
1	55	\$26.00	\$8.58	\$5.72	\$0.00	\$40.30	
2	65	\$30.73	\$8.58	\$17.93	\$0.00	\$57.24	
3	75	\$35.45	\$8.58	\$18.98	\$0.00	\$63.01	
4	85	\$40.18	\$8.58	\$20.01	\$0.00	\$68.77	
Notes: Step 1&2 Appr. indentured after 1/6/2020 receive no pension, but do receive annuity. (Step 1 \$5.72, Step 2 \$6.66) Steps are 2,000 hours							
Apprentice to Journeyworker Ratio:1:4							
MORTAR MIXER LABORERS - ZONE 1		12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
For apprentice rates see "Apprentice- LABORER"							
OILER (OTHER THAN TRUCK CRANES,GRADALLS) <i>OPERATING ENGINEERS LOCAL 4</i>		12/01/2023	\$24.41	\$15.00	\$16.40	\$0.00	\$55.81
		06/01/2024	\$25.01	\$15.00	\$16.40	\$0.00	\$56.41
		12/01/2024	\$25.67	\$15.00	\$16.40	\$0.00	\$57.07
		06/01/2025	\$26.27	\$15.00	\$16.40	\$0.00	\$57.67
		12/01/2025	\$26.93	\$15.00	\$16.40	\$0.00	\$58.33
		06/01/2026	\$27.52	\$15.00	\$16.40	\$0.00	\$58.92
		12/01/2026	\$28.19	\$15.00	\$16.40	\$0.00	\$59.59
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
OILER (TRUCK CRANES, GRADALLS) <i>OPERATING ENGINEERS LOCAL 4</i>		12/01/2023	\$29.86	\$15.00	\$16.40	\$0.00	\$61.26
		06/01/2024	\$30.58	\$15.00	\$16.40	\$0.00	\$61.98
		12/01/2024	\$31.38	\$15.00	\$16.40	\$0.00	\$62.78
		06/01/2025	\$32.10	\$15.00	\$16.40	\$0.00	\$63.50
		12/01/2025	\$32.90	\$15.00	\$16.40	\$0.00	\$64.30
		06/01/2026	\$33.62	\$15.00	\$16.40	\$0.00	\$65.02
		12/01/2026	\$34.42	\$15.00	\$16.40	\$0.00	\$65.82
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
OTHER POWER DRIVEN EQUIPMENT - CLASS II <i>OPERATING ENGINEERS LOCAL 4</i>		12/01/2023	\$54.43	\$15.00	\$16.40	\$0.00	\$85.83
		06/01/2024	\$55.71	\$15.00	\$16.40	\$0.00	\$87.11
		12/01/2024	\$57.15	\$15.00	\$16.40	\$0.00	\$88.55
		06/01/2025	\$58.43	\$15.00	\$16.40	\$0.00	\$89.83
		12/01/2025	\$59.87	\$15.00	\$16.40	\$0.00	\$91.27
		06/01/2026	\$61.15	\$15.00	\$16.40	\$0.00	\$92.55
		12/01/2026	\$62.59	\$15.00	\$16.40	\$0.00	\$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"							
PAINTER (BRIDGES/TANKS) <i>PAINTERS LOCAL 35 - ZONE 2</i>		01/01/2024	\$56.06	\$9.95	\$23.95	\$0.00	\$89.96
		07/01/2024	\$57.26	\$9.95	\$23.95	\$0.00	\$91.16
		01/01/2025	\$58.46	\$9.95	\$23.95	\$0.00	\$92.36

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$28.03	\$9.95	\$0.00	\$0.00	\$37.98
2	55	\$30.83	\$9.95	\$6.66	\$0.00	\$47.44
3	60	\$33.64	\$9.95	\$7.26	\$0.00	\$50.85
4	65	\$36.44	\$9.95	\$7.87	\$0.00	\$54.26
5	70	\$39.24	\$9.95	\$20.32	\$0.00	\$69.51
6	75	\$42.05	\$9.95	\$20.93	\$0.00	\$72.93
7	80	\$44.85	\$9.95	\$21.53	\$0.00	\$76.33
8	90	\$50.45	\$9.95	\$22.74	\$0.00	\$83.14

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$28.63	\$9.95	\$0.00	\$0.00	\$38.58
2	55	\$31.49	\$9.95	\$6.66	\$0.00	\$48.10
3	60	\$34.36	\$9.95	\$7.26	\$0.00	\$51.57
4	65	\$37.22	\$9.95	\$7.87	\$0.00	\$55.04
5	70	\$40.08	\$9.95	\$20.32	\$0.00	\$70.35
6	75	\$42.95	\$9.95	\$20.93	\$0.00	\$73.83
7	80	\$45.81	\$9.95	\$21.53	\$0.00	\$77.29
8	90	\$51.53	\$9.95	\$22.74	\$0.00	\$84.22

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	01/01/2024	\$46.96	\$9.95	\$23.95	\$0.00	\$80.86
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.PAINTERS LOCAL 35 - ZONE 2	07/01/2024	\$48.16	\$9.95	\$23.95	\$0.00	\$82.06
	01/01/2025	\$49.36	\$9.95	\$23.95	\$0.00	\$83.26

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - New

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.48	\$9.95	\$0.00	\$0.00	\$33.43
2	55	\$25.83	\$9.95	\$6.66	\$0.00	\$42.44
3	60	\$28.18	\$9.95	\$7.26	\$0.00	\$45.39
4	65	\$30.52	\$9.95	\$7.87	\$0.00	\$48.34
5	70	\$32.87	\$9.95	\$20.32	\$0.00	\$63.14
6	75	\$35.22	\$9.95	\$20.93	\$0.00	\$66.10
7	80	\$37.57	\$9.95	\$21.53	\$0.00	\$69.05
8	90	\$42.26	\$9.95	\$22.74	\$0.00	\$74.95

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.08	\$9.95	\$0.00	\$0.00	\$34.03
2	55	\$26.49	\$9.95	\$6.66	\$0.00	\$43.10
3	60	\$28.90	\$9.95	\$7.26	\$0.00	\$46.11
4	65	\$31.30	\$9.95	\$7.87	\$0.00	\$49.12
5	70	\$33.71	\$9.95	\$20.32	\$0.00	\$63.98
6	75	\$36.12	\$9.95	\$20.93	\$0.00	\$67.00
7	80	\$38.53	\$9.95	\$21.53	\$0.00	\$70.01
8	90	\$43.34	\$9.95	\$22.74	\$0.00	\$76.03

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT) PAINTERS LOCAL 35 - ZONE 2	01/01/2024	\$45.02	\$9.95	\$23.95	\$0.00	\$78.92
	07/01/2024	\$46.22	\$9.95	\$23.95	\$0.00	\$80.12
	01/01/2025	\$47.42	\$9.95	\$23.95	\$0.00	\$81.32

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.51	\$9.95	\$0.00	\$0.00	\$32.46
2	55	\$24.76	\$9.95	\$6.66	\$0.00	\$41.37
3	60	\$27.01	\$9.95	\$7.26	\$0.00	\$44.22
4	65	\$29.26	\$9.95	\$7.87	\$0.00	\$47.08
5	70	\$31.51	\$9.95	\$20.32	\$0.00	\$61.78
6	75	\$33.77	\$9.95	\$20.93	\$0.00	\$64.65
7	80	\$36.02	\$9.95	\$21.53	\$0.00	\$67.50
8	90	\$40.52	\$9.95	\$22.74	\$0.00	\$73.21

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.11	\$9.95	\$0.00	\$0.00	\$33.06
2	55	\$25.42	\$9.95	\$6.66	\$0.00	\$42.03
3	60	\$27.73	\$9.95	\$7.26	\$0.00	\$44.94
4	65	\$30.04	\$9.95	\$7.87	\$0.00	\$47.86
5	70	\$32.35	\$9.95	\$20.32	\$0.00	\$62.62
6	75	\$34.67	\$9.95	\$20.93	\$0.00	\$65.55
7	80	\$36.98	\$9.95	\$21.53	\$0.00	\$68.46
8	90	\$41.60	\$9.95	\$22.74	\$0.00	\$74.29

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, NEW) *	01/01/2024	\$45.56	\$9.95	\$23.95	\$0.00	\$79.46
* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.PAINTERS LOCAL 35 - ZONE 2	07/01/2024	\$46.76	\$9.95	\$23.95	\$0.00	\$80.66
	01/01/2025	\$47.96	\$9.95	\$23.95	\$0.00	\$81.86

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - PAINTER - Local 35 Zone 2 - BRUSH NEW

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.78	\$9.95	\$0.00	\$0.00	\$32.73
2	55	\$25.06	\$9.95	\$6.66	\$0.00	\$41.67
3	60	\$27.34	\$9.95	\$7.26	\$0.00	\$44.55
4	65	\$29.61	\$9.95	\$7.87	\$0.00	\$47.43
5	70	\$31.89	\$9.95	\$20.32	\$0.00	\$62.16
6	75	\$34.17	\$9.95	\$20.93	\$0.00	\$65.05
7	80	\$36.45	\$9.95	\$21.53	\$0.00	\$67.93
8	90	\$41.00	\$9.95	\$22.74	\$0.00	\$73.69

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.38	\$9.95	\$0.00	\$0.00	\$33.33
2	55	\$25.72	\$9.95	\$6.66	\$0.00	\$42.33
3	60	\$28.06	\$9.95	\$7.26	\$0.00	\$45.27
4	65	\$30.39	\$9.95	\$7.87	\$0.00	\$48.21
5	70	\$32.73	\$9.95	\$20.32	\$0.00	\$63.00
6	75	\$35.07	\$9.95	\$20.93	\$0.00	\$65.95
7	80	\$37.41	\$9.95	\$21.53	\$0.00	\$68.89
8	90	\$42.08	\$9.95	\$22.74	\$0.00	\$74.77

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) PAINTERS LOCAL 35 - ZONE 2	01/01/2024	\$43.62	\$9.95	\$23.95	\$0.00	\$77.52
	07/01/2024	\$44.82	\$9.95	\$23.95	\$0.00	\$78.72
	01/01/2025	\$46.02	\$9.95	\$23.95	\$0.00	\$79.92

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - PAINTER Local 35 Zone 2 - BRUSH REPAINT

Effective Date - 01/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.81	\$9.95	\$0.00	\$0.00	\$31.76
2	55	\$23.99	\$9.95	\$6.66	\$0.00	\$40.60
3	60	\$26.17	\$9.95	\$7.26	\$0.00	\$43.38
4	65	\$28.35	\$9.95	\$7.87	\$0.00	\$46.17
5	70	\$30.53	\$9.95	\$20.32	\$0.00	\$60.80
6	75	\$32.72	\$9.95	\$20.93	\$0.00	\$63.60
7	80	\$34.90	\$9.95	\$21.53	\$0.00	\$66.38
8	90	\$39.26	\$9.95	\$22.74	\$0.00	\$71.95

Effective Date - 07/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.41	\$9.95	\$0.00	\$0.00	\$32.36
2	55	\$24.65	\$9.95	\$6.66	\$0.00	\$41.26
3	60	\$26.89	\$9.95	\$7.26	\$0.00	\$44.10
4	65	\$29.13	\$9.95	\$7.87	\$0.00	\$46.95
5	70	\$31.37	\$9.95	\$20.32	\$0.00	\$61.64
6	75	\$33.62	\$9.95	\$20.93	\$0.00	\$64.50
7	80	\$35.86	\$9.95	\$21.53	\$0.00	\$67.34
8	90	\$40.34	\$9.95	\$22.74	\$0.00	\$73.03

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY)	12/01/2023	\$44.33	\$9.65	\$18.07	\$0.00	\$72.05
LABORERS - ZONE 1 (HEAVY & HIGHWAY)	06/01/2024	\$45.81	\$9.65	\$18.07	\$0.00	\$73.53
	12/01/2024	\$47.28	\$9.65	\$18.07	\$0.00	\$75.00
	06/01/2025	\$48.78	\$9.65	\$18.07	\$0.00	\$76.50
	12/01/2025	\$50.28	\$9.65	\$18.07	\$0.00	\$78.00
	06/01/2026	\$51.83	\$9.65	\$18.07	\$0.00	\$79.55
	12/01/2026	\$53.33	\$9.65	\$18.07	\$0.00	\$81.05

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

PANEL & PICKUP TRUCKS DRIVER	12/01/2023	\$39.88	\$14.41	\$18.67	\$0.00	\$72.96
TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	06/01/2024	\$40.88	\$14.41	\$18.67	\$0.00	\$73.96
	08/01/2024	\$40.88	\$14.91	\$18.67	\$0.00	\$74.46
	12/01/2024	\$40.88	\$14.91	\$20.17	\$0.00	\$75.96
	06/01/2025	\$41.88	\$14.91	\$20.17	\$0.00	\$76.96
	08/01/2025	\$41.88	\$15.41	\$20.17	\$0.00	\$77.46
	12/01/2025	\$41.88	\$15.41	\$21.78	\$0.00	\$79.07
	06/01/2026	\$42.88	\$15.41	\$21.78	\$0.00	\$80.07
	08/01/2026	\$42.88	\$15.91	\$21.78	\$0.00	\$80.57
	12/01/2026	\$42.88	\$15.91	\$23.52	\$0.00	\$82.31

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK)	08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.59
<i>PILE DRIVER LOCAL 56 (ZONE 1)</i>						
For apprentice rates see "Apprentice- PILE DRIVER"						
PILE DRIVER	08/01/2020	\$49.07	\$9.40	\$23.12	\$0.00	\$81.59
<i>PILE DRIVER LOCAL 56 (ZONE 1)</i>						

Apprentice - PILE DRIVER - Local 56 Zone I

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.54	\$9.40	\$23.12	\$0.00	\$57.06
2	60	\$29.44	\$9.40	\$23.12	\$0.00	\$61.96
3	70	\$34.35	\$9.40	\$23.12	\$0.00	\$66.87
4	75	\$36.80	\$9.40	\$23.12	\$0.00	\$69.32
5	80	\$39.26	\$9.40	\$23.12	\$0.00	\$71.78
6	80	\$39.26	\$9.40	\$23.12	\$0.00	\$71.78
7	90	\$44.16	\$9.40	\$23.12	\$0.00	\$76.68
8	90	\$44.16	\$9.40	\$23.12	\$0.00	\$76.68

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 \$34.01/ 3&4 \$41.46/ 5&6 \$62.80/ 7&8 \$69.25

Apprentice to Journeyworker Ratio:1:5

PIPEFITTER & STEAMFITTER	09/01/2023	\$63.48	\$12.70	\$21.50	\$0.00	\$97.68
<i>PIPEFITTERS LOCAL 537</i>						
	03/01/2024	\$65.28	\$12.70	\$21.50	\$0.00	\$99.48
	09/01/2024	\$67.08	\$12.70	\$21.50	\$0.00	\$101.28
	03/01/2025	\$68.88	\$12.70	\$21.50	\$0.00	\$103.08

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - PIPEFITTER - Local 537

Effective Date - 09/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$25.39	\$12.70	\$9.05	\$0.00	\$47.14
2	45	\$28.57	\$12.70	\$21.50	\$0.00	\$62.77
3	60	\$38.09	\$12.70	\$21.50	\$0.00	\$72.29
4	70	\$44.44	\$12.70	\$21.50	\$0.00	\$78.64
5	80	\$50.78	\$12.70	\$21.50	\$0.00	\$84.98

Effective Date - 03/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$26.11	\$12.70	\$9.05	\$0.00	\$47.86
2	45	\$29.38	\$12.70	\$21.50	\$0.00	\$63.58
3	60	\$39.17	\$12.70	\$21.50	\$0.00	\$73.37
4	70	\$45.70	\$12.70	\$21.50	\$0.00	\$79.90
5	80	\$52.22	\$12.70	\$21.50	\$0.00	\$86.42

Notes:

** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.

Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

PIPELAYER LABORERS - ZONE 1	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
For apprentice rates see "Apprentice- LABORER"						
PIPELAYER (HEAVY & HIGHWAY) LABORERS - ZONE 1 (HEAVY & HIGHWAY)	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
	06/01/2024	\$46.06	\$9.65	\$18.07	\$0.00	\$73.78
	12/01/2024	\$47.53	\$9.65	\$18.07	\$0.00	\$75.25
	06/01/2025	\$49.03	\$9.65	\$18.07	\$0.00	\$76.75
	12/01/2025	\$50.53	\$9.65	\$18.07	\$0.00	\$78.25
	06/01/2026	\$52.08	\$9.65	\$18.07	\$0.00	\$79.80
	12/01/2026	\$53.58	\$9.65	\$18.07	\$0.00	\$81.30
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
PLUMBERS & GASFITTERS PLUMBERS & GASFITTERS LOCAL 12	09/03/2023	\$66.44	\$14.07	\$18.86	\$0.00	\$99.37
	03/03/2024	\$68.24	\$14.07	\$18.86	\$0.00	\$101.17
	09/01/2024	\$70.04	\$14.07	\$18.86	\$0.00	\$102.97
	03/02/2025	\$71.34	\$14.32	\$19.11	\$0.00	\$104.77

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - PLUMBER/GASFITTER - Local 12

Effective Date - 09/03/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$23.25	\$14.07	\$6.80	\$0.00	\$44.12
2	40	\$26.58	\$14.07	\$7.72	\$0.00	\$48.37
3	55	\$36.54	\$14.07	\$10.51	\$0.00	\$61.12
4	65	\$43.19	\$14.07	\$12.36	\$0.00	\$69.62
5	75	\$49.83	\$14.07	\$14.22	\$0.00	\$78.12

Effective Date - 03/03/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$23.88	\$14.07	\$6.80	\$0.00	\$44.75
2	40	\$27.30	\$14.07	\$7.72	\$0.00	\$49.09
3	55	\$37.53	\$14.07	\$10.51	\$0.00	\$62.11
4	65	\$44.36	\$14.07	\$12.36	\$0.00	\$70.79
5	75	\$51.18	\$14.07	\$14.22	\$0.00	\$79.47

Notes:

** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic\$69.00, Step5 with lic\$76.87

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) <i>PIPEFITTERS LOCAL 537</i>	09/01/2023	\$63.48	\$12.70	\$21.50	\$0.00	\$97.68
	03/01/2024	\$65.28	\$12.70	\$21.50	\$0.00	\$99.48
	09/01/2024	\$67.08	\$12.70	\$21.50	\$0.00	\$101.28
	03/01/2025	\$68.88	\$12.70	\$21.50	\$0.00	\$103.08

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

PNEUMATIC DRILL/TOOL OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
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For apprentice rates see "Apprentice- LABORER"

PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
	06/01/2024	\$46.06	\$9.65	\$18.07	\$0.00	\$73.78
	12/01/2024	\$47.53	\$9.65	\$18.07	\$0.00	\$75.25
	06/01/2025	\$49.03	\$9.65	\$18.07	\$0.00	\$76.75
	12/01/2025	\$50.53	\$9.65	\$18.07	\$0.00	\$78.25
	06/01/2026	\$52.08	\$9.65	\$18.07	\$0.00	\$79.80
	12/01/2026	\$53.58	\$9.65	\$18.07	\$0.00	\$81.30

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

POWDERMAN & BLASTER <i>LABORERS - ZONE 1</i>	12/01/2023	\$45.33	\$9.65	\$18.07	\$0.00	\$73.05
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For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
POWDERMAN & BLASTER (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2023	\$45.33	\$9.65	\$18.07	\$0.00	\$73.05
	06/01/2024	\$46.81	\$9.65	\$18.07	\$0.00	\$74.53
	12/01/2024	\$48.28	\$9.65	\$18.07	\$0.00	\$76.00
	06/01/2025	\$49.78	\$9.65	\$18.07	\$0.00	\$77.50
	12/01/2025	\$51.28	\$9.65	\$18.07	\$0.00	\$79.00
	06/01/2026	\$52.83	\$9.65	\$18.07	\$0.00	\$80.55
	12/01/2026	\$54.33	\$9.65	\$18.07	\$0.00	\$82.05
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$55.03	\$15.00	\$16.40	\$0.00	\$86.43
	06/01/2024	\$56.33	\$15.00	\$16.40	\$0.00	\$87.73
	12/01/2024	\$57.78	\$15.00	\$16.40	\$0.00	\$89.18
	06/01/2025	\$59.08	\$15.00	\$16.40	\$0.00	\$90.48
	12/01/2025	\$60.53	\$15.00	\$16.40	\$0.00	\$91.93
	06/01/2026	\$61.83	\$15.00	\$16.40	\$0.00	\$93.23
	12/01/2026	\$63.28	\$15.00	\$16.40	\$0.00	\$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$54.43	\$15.00	\$16.40	\$0.00	\$85.83
	06/01/2024	\$55.71	\$15.00	\$16.40	\$0.00	\$87.11
	12/01/2024	\$57.15	\$15.00	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.43	\$15.00	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.87	\$15.00	\$16.40	\$0.00	\$91.27
	06/01/2026	\$61.15	\$15.00	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.59	\$15.00	\$16.40	\$0.00	\$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$35.62	\$15.00	\$16.40	\$0.00	\$67.02
	06/01/2024	\$36.47	\$15.00	\$16.40	\$0.00	\$67.87
	12/01/2024	\$37.42	\$15.00	\$16.40	\$0.00	\$68.82
	06/01/2025	\$38.27	\$15.00	\$16.40	\$0.00	\$69.67
	12/01/2025	\$39.22	\$15.00	\$16.40	\$0.00	\$70.62
	06/01/2026	\$40.08	\$15.00	\$16.40	\$0.00	\$71.48
	12/01/2026	\$41.03	\$15.00	\$16.40	\$0.00	\$72.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY MIX CONCRETE DRIVERS after 4/30/12 (Drivers Hired After 4/30/2012) <i>TEAMSTERS 25 (Metro) - Aggregate</i>	08/01/2022	\$30.40	\$11.91	\$15.25	\$0.00	\$57.56
READY-MIX CONCRETE DRIVER <i>TEAMSTERS 25 (Metro) - Aggregate</i>	08/01/2022	\$34.41	\$11.91	\$15.25	\$0.00	\$61.57
RECLAIMERS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$54.43	\$15.00	\$16.40	\$0.00	\$85.83
	06/01/2024	\$55.71	\$15.00	\$16.40	\$0.00	\$87.11
	12/01/2024	\$57.15	\$15.00	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.43	\$15.00	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.87	\$15.00	\$16.40	\$0.00	\$91.27
	06/01/2026	\$61.15	\$15.00	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.59	\$15.00	\$16.40	\$0.00	\$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RIDE-ON MOTORIZED BUGGY OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ROLLER/SPREADER/MULCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$54.43	\$15.00	\$16.40	\$0.00	\$85.83
	06/01/2024	\$55.71	\$15.00	\$16.40	\$0.00	\$87.11
	12/01/2024	\$57.15	\$15.00	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.43	\$15.00	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.87	\$15.00	\$16.40	\$0.00	\$91.27
	06/01/2026	\$61.15	\$15.00	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.59	\$15.00	\$16.40	\$0.00	\$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

ROOFER (Inc.Roofers Waterproofng &Roofer Damproofg) <i>ROOFERS LOCAL 33</i>	02/01/2024	\$50.03	\$12.78	\$21.45	\$0.00	\$84.26
	08/01/2024	\$51.53	\$12.78	\$21.45	\$0.00	\$85.76
	02/01/2025	\$52.78	\$12.78	\$21.45	\$0.00	\$87.01
	08/01/2025	\$54.28	\$12.78	\$21.45	\$0.00	\$88.51
	02/01/2026	\$55.53	\$12.78	\$21.45	\$0.00	\$89.76

Apprentice - ROOFER - Local 33

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.02	\$12.78	\$6.21	\$0.00	\$44.01
2	60	\$30.02	\$12.78	\$21.45	\$0.00	\$64.25
3	65	\$32.52	\$12.78	\$21.45	\$0.00	\$66.75
4	75	\$37.52	\$12.78	\$21.45	\$0.00	\$71.75
5	85	\$42.53	\$12.78	\$21.45	\$0.00	\$76.76

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.77	\$12.78	\$6.21	\$0.00	\$44.76
2	60	\$30.92	\$12.78	\$21.45	\$0.00	\$65.15
3	65	\$33.49	\$12.78	\$21.45	\$0.00	\$67.72
4	75	\$38.65	\$12.78	\$21.45	\$0.00	\$72.88
5	85	\$43.80	\$12.78	\$21.45	\$0.00	\$78.03

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1

Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.

(Hot Pitch Mechanics' receive \$1.00 hr. above ROOFER)

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE <i>ROOFERS LOCAL 33</i>	02/01/2024	\$50.28	\$12.78	\$21.45	\$0.00	\$84.51
	08/01/2024	\$51.78	\$12.78	\$21.45	\$0.00	\$86.01
	02/01/2025	\$53.03	\$12.78	\$21.45	\$0.00	\$87.26
	08/01/2025	\$54.53	\$12.78	\$21.45	\$0.00	\$88.76
	02/01/2026	\$55.78	\$12.78	\$21.45	\$0.00	\$90.01

For apprentice rates see "Apprentice- ROOFER"

SHEETMETAL WORKER <i>SHEETMETAL WORKERS LOCAL 17-A</i>	02/01/2024	\$57.86	\$14.43	\$27.07	\$2.93	\$102.29
	08/01/2024	\$59.61	\$14.43	\$27.07	\$2.93	\$104.04
	02/01/2025	\$61.36	\$14.43	\$27.07	\$2.93	\$105.79
	08/01/2025	\$63.21	\$14.43	\$27.07	\$2.93	\$107.64
	02/01/2026	\$65.16	\$14.43	\$27.07	\$2.93	\$109.59

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - SHEET METAL WORKER - Local 17-A

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	\$24.30	\$14.43	\$6.13	\$0.00	\$44.86
2	42	\$24.30	\$14.43	\$6.13	\$0.00	\$44.86
3	47	\$27.19	\$14.43	\$12.11	\$1.61	\$55.34
4	47	\$27.19	\$14.43	\$12.11	\$1.61	\$55.34
5	52	\$30.09	\$14.43	\$13.09	\$1.73	\$59.34
6	52	\$30.09	\$14.43	\$13.34	\$1.73	\$59.59
7	60	\$34.72	\$14.43	\$14.75	\$1.92	\$65.82
8	65	\$37.61	\$14.43	\$15.73	\$2.03	\$69.80
9	75	\$43.40	\$14.43	\$17.69	\$2.27	\$77.79
10	85	\$49.18	\$14.43	\$19.15	\$2.48	\$85.24

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	\$25.04	\$14.43	\$6.13	\$0.00	\$45.60
2	42	\$25.04	\$14.43	\$6.13	\$0.00	\$45.60
3	47	\$28.02	\$14.43	\$12.11	\$1.64	\$56.20
4	47	\$28.02	\$14.43	\$12.11	\$1.64	\$56.20
5	52	\$31.00	\$14.43	\$13.09	\$1.76	\$60.28
6	52	\$31.00	\$14.43	\$13.34	\$1.76	\$60.53
7	60	\$35.77	\$14.43	\$14.75	\$1.95	\$66.90
8	65	\$38.75	\$14.43	\$15.73	\$2.07	\$70.98
9	75	\$44.71	\$14.43	\$17.69	\$2.30	\$79.13
10	85	\$50.67	\$14.43	\$19.15	\$2.53	\$86.78

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SPECIALIZED EARTH MOVING EQUIP < 35 TONS TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	12/01/2023	\$40.34	\$14.41	\$18.67	\$0.00	\$73.42
	06/01/2024	\$41.34	\$14.41	\$18.67	\$0.00	\$74.42
	08/01/2024	\$41.34	\$14.91	\$18.67	\$0.00	\$74.92
	12/01/2024	\$41.34	\$14.91	\$20.17	\$0.00	\$76.42
	06/01/2025	\$42.34	\$14.91	\$20.17	\$0.00	\$77.42
	08/01/2025	\$42.34	\$15.41	\$20.17	\$0.00	\$77.92
	12/01/2025	\$42.34	\$15.41	\$21.78	\$0.00	\$79.53
	06/01/2026	\$43.34	\$15.41	\$21.78	\$0.00	\$80.53
	08/01/2026	\$43.34	\$15.91	\$21.78	\$0.00	\$81.03
	12/01/2026	\$43.34	\$15.91	\$23.52	\$0.00	\$82.77

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SPECIALIZED EARTH MOVING EQUIP > 35 TONS <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2023	\$40.63	\$14.41	\$18.67	\$0.00	\$73.71
	06/01/2024	\$41.63	\$14.41	\$18.67	\$0.00	\$74.71
	08/01/2024	\$41.63	\$14.91	\$18.67	\$0.00	\$75.21
	12/01/2024	\$41.63	\$14.91	\$20.17	\$0.00	\$76.71
	06/01/2025	\$42.63	\$14.91	\$20.17	\$0.00	\$77.71
	08/01/2025	\$42.63	\$15.41	\$20.17	\$0.00	\$78.21
	12/01/2025	\$42.63	\$15.41	\$21.78	\$0.00	\$79.82
	06/01/2026	\$43.63	\$15.41	\$21.78	\$0.00	\$80.82
	08/01/2026	\$43.63	\$15.91	\$21.78	\$0.00	\$81.32
	12/01/2026	\$43.63	\$15.91	\$23.52	\$0.00	\$83.06
SPRINKLER FITTER <i>SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1</i>	10/01/2023	\$67.95	\$10.90	\$23.20	\$0.00	\$102.05
	03/01/2024	\$69.75	\$10.90	\$23.20	\$0.00	\$103.85
	10/01/2024	\$71.55	\$10.90	\$23.20	\$0.00	\$105.65
	03/01/2025	\$73.35	\$10.90	\$23.20	\$0.00	\$107.45

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - SPRINKLER FITTER - Local 550 (Section A) Zone 1

Effective Date - 10/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$23.78	\$10.90	\$12.80	\$0.00	\$47.48
2	40	\$27.18	\$10.90	\$13.60	\$0.00	\$51.68
3	45	\$30.58	\$10.90	\$14.40	\$0.00	\$55.88
4	50	\$33.98	\$10.90	\$15.20	\$0.00	\$60.08
5	55	\$37.37	\$10.90	\$16.00	\$0.00	\$64.27
6	60	\$40.77	\$10.90	\$16.80	\$0.00	\$68.47
7	65	\$44.17	\$10.90	\$17.60	\$0.00	\$72.67
8	70	\$47.57	\$10.90	\$18.40	\$0.00	\$76.87
9	75	\$50.96	\$10.90	\$19.20	\$0.00	\$81.06
10	80	\$54.36	\$10.90	\$20.00	\$0.00	\$85.26

Effective Date - 03/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$24.41	\$10.90	\$12.80	\$0.00	\$48.11
2	40	\$27.90	\$10.90	\$13.60	\$0.00	\$52.40
3	45	\$31.39	\$10.90	\$14.40	\$0.00	\$56.69
4	50	\$34.88	\$10.90	\$15.20	\$0.00	\$60.98
5	55	\$38.36	\$10.90	\$16.00	\$0.00	\$65.26
6	60	\$41.85	\$10.90	\$16.80	\$0.00	\$69.55
7	65	\$45.34	\$10.90	\$17.60	\$0.00	\$73.84
8	70	\$48.83	\$10.90	\$18.40	\$0.00	\$78.13
9	75	\$52.31	\$10.90	\$19.20	\$0.00	\$82.41
10	80	\$55.80	\$10.90	\$20.00	\$0.00	\$86.70

Notes: Apprentice entered prior 9/30/10:

40/45/50/55/60/65/70/75/80/85

Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR OPERATING ENGINEERS LOCAL 4	12/01/2023	\$54.43	\$15.00	\$16.40	\$0.00	\$85.83
	06/01/2024	\$55.71	\$15.00	\$16.40	\$0.00	\$87.11
	12/01/2024	\$57.15	\$15.00	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.43	\$15.00	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.87	\$15.00	\$16.40	\$0.00	\$91.27
	06/01/2026	\$61.15	\$15.00	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.59	\$15.00	\$16.40	\$0.00	\$93.99

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$54.43	\$15.00	\$16.40	\$0.00	\$85.83
	06/01/2024	\$55.71	\$15.00	\$16.40	\$0.00	\$87.11
	12/01/2024	\$57.15	\$15.00	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.43	\$15.00	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.87	\$15.00	\$16.40	\$0.00	\$91.27
	06/01/2026	\$61.15	\$15.00	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.59	\$15.00	\$16.40	\$0.00	\$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TELECOMMUNICATION TECHNICIAN <i>ELECTRICIANS LOCAL 103</i>	09/01/2023	\$49.11	\$13.00	\$19.68	\$0.00	\$81.79
	03/01/2024	\$49.49	\$13.00	\$20.19	\$0.00	\$82.68
	09/01/2024	\$51.02	\$13.00	\$20.24	\$0.00	\$84.26
	03/01/2025	\$51.98	\$13.00	\$20.27	\$0.00	\$85.25
	09/01/2025	\$53.51	\$13.00	\$20.32	\$0.00	\$86.83
	03/01/2026	\$54.47	\$13.00	\$20.34	\$0.00	\$87.81
	09/01/2026	\$56.00	\$13.00	\$20.39	\$0.00	\$89.39
	03/01/2027	\$56.95	\$13.00	\$20.42	\$0.00	\$90.37
	09/01/2027	\$58.49	\$13.00	\$20.46	\$0.00	\$91.95
	03/01/2028	\$59.45	\$13.00	\$20.49	\$0.00	\$92.94

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - TELECOMMUNICATION TECHNICIAN - Local 103

Effective Date - 09/01/2023

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$22.10	\$13.00	\$0.66	\$0.00	\$35.76
2	45	\$22.10	\$13.00	\$0.66	\$0.00	\$35.76
3	50	\$24.56	\$13.00	\$15.66	\$0.00	\$53.22
4	50	\$24.56	\$13.00	\$15.66	\$0.00	\$53.22
5	55	\$27.01	\$13.00	\$16.06	\$0.00	\$56.07
6	60	\$29.47	\$13.00	\$16.46	\$0.00	\$58.93
7	65	\$31.92	\$13.00	\$16.87	\$0.00	\$61.79
8	70	\$34.38	\$13.00	\$17.27	\$0.00	\$64.65
9	75	\$36.83	\$13.00	\$17.67	\$0.00	\$67.50
10	80	\$39.29	\$13.00	\$18.07	\$0.00	\$70.36

Effective Date - 03/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	\$22.27	\$13.00	\$0.67	\$0.00	\$35.94
2	45	\$22.27	\$13.00	\$0.67	\$0.00	\$35.94
3	50	\$24.75	\$13.00	\$16.16	\$0.00	\$53.91
4	50	\$24.75	\$13.00	\$16.16	\$0.00	\$53.91
5	55	\$27.22	\$13.00	\$16.57	\$0.00	\$56.79
6	60	\$29.69	\$13.00	\$16.97	\$0.00	\$59.66
7	65	\$32.17	\$13.00	\$17.38	\$0.00	\$62.55
8	70	\$34.64	\$13.00	\$17.78	\$0.00	\$65.42
9	75	\$37.12	\$13.00	\$18.18	\$0.00	\$68.30
10	80	\$39.59	\$13.00	\$18.58	\$0.00	\$71.17

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS BRICKLAYERS LOCAL 3 - MARBLE & TILE	02/01/2024	\$61.34	\$11.49	\$23.59	\$0.00	\$96.42
	08/01/2024	\$63.44	\$11.49	\$23.59	\$0.00	\$98.52
	02/01/2025	\$64.74	\$11.49	\$23.59	\$0.00	\$99.82
	08/01/2025	\$66.89	\$11.49	\$23.59	\$0.00	\$101.97
	02/01/2026	\$68.24	\$11.49	\$23.59	\$0.00	\$103.32
	08/01/2026	\$70.44	\$11.49	\$23.59	\$0.00	\$105.52
	02/01/2027	\$71.84	\$11.49	\$23.59	\$0.00	\$106.92

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile

Effective Date - 02/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$30.67	\$11.49	\$23.59	\$0.00	\$65.75
2	60	\$36.80	\$11.49	\$23.59	\$0.00	\$71.88
3	70	\$42.94	\$11.49	\$23.59	\$0.00	\$78.02
4	80	\$49.07	\$11.49	\$23.59	\$0.00	\$84.15
5	90	\$55.21	\$11.49	\$23.59	\$0.00	\$90.29

Effective Date - 08/01/2024

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$31.72	\$11.49	\$23.59	\$0.00	\$66.80
2	60	\$38.06	\$11.49	\$23.59	\$0.00	\$73.14
3	70	\$44.41	\$11.49	\$23.59	\$0.00	\$79.49
4	80	\$50.75	\$11.49	\$23.59	\$0.00	\$85.83
5	90	\$57.10	\$11.49	\$23.59	\$0.00	\$92.18

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2023	\$48.33	\$9.65	\$18.22	\$0.00	\$76.20
	06/01/2024	\$49.81	\$9.65	\$18.22	\$0.00	\$77.68
	12/01/2024	\$51.28	\$9.65	\$18.22	\$0.00	\$79.15
	06/01/2025	\$52.78	\$9.65	\$18.22	\$0.00	\$80.65
	12/01/2025	\$54.28	\$9.65	\$18.22	\$0.00	\$82.15
	06/01/2026	\$55.83	\$9.65	\$18.22	\$0.00	\$83.70
	12/01/2026	\$57.33	\$9.65	\$18.22	\$0.00	\$85.20

For apprentice rates see "Apprentice- LABORER"

TEST BORING DRILLER HELPER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2023	\$44.45	\$9.65	\$18.22	\$0.00	\$72.32
	06/01/2024	\$45.93	\$9.65	\$18.22	\$0.00	\$73.80
	12/01/2024	\$47.40	\$9.65	\$18.22	\$0.00	\$75.27
	06/01/2025	\$48.90	\$9.65	\$18.22	\$0.00	\$76.77
	12/01/2025	\$50.40	\$9.65	\$18.22	\$0.00	\$78.27
	06/01/2026	\$51.95	\$9.65	\$18.22	\$0.00	\$79.82
	12/01/2026	\$53.45	\$9.65	\$18.22	\$0.00	\$81.32

For apprentice rates see "Apprentice- LABORER"

TEST BORING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2023	\$44.33	\$9.65	\$18.22	\$0.00	\$72.20
	06/01/2024	\$45.81	\$9.65	\$18.22	\$0.00	\$73.68
	12/01/2024	\$47.28	\$9.65	\$18.22	\$0.00	\$75.15
	06/01/2025	\$48.78	\$9.65	\$18.22	\$0.00	\$76.65
	12/01/2025	\$50.28	\$9.65	\$18.22	\$0.00	\$78.15
	06/01/2026	\$51.83	\$9.65	\$18.22	\$0.00	\$79.70
	12/01/2026	\$53.33	\$9.65	\$18.22	\$0.00	\$81.20

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TRACTORS/PORTABLE STEAM GENERATORS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$54.43	\$15.00	\$16.40	\$0.00	\$85.83
	06/01/2024	\$55.71	\$15.00	\$16.40	\$0.00	\$87.11
	12/01/2024	\$57.15	\$15.00	\$16.40	\$0.00	\$88.55
	06/01/2025	\$58.43	\$15.00	\$16.40	\$0.00	\$89.83
	12/01/2025	\$59.87	\$15.00	\$16.40	\$0.00	\$91.27
	06/01/2026	\$61.15	\$15.00	\$16.40	\$0.00	\$92.55
	12/01/2026	\$62.59	\$15.00	\$16.40	\$0.00	\$93.99
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2023	\$40.92	\$14.41	\$18.67	\$0.00	\$74.00
	06/01/2024	\$41.92	\$14.41	\$18.67	\$0.00	\$75.00
	08/01/2024	\$41.92	\$14.91	\$18.67	\$0.00	\$75.50
	12/01/2024	\$41.92	\$14.91	\$20.17	\$0.00	\$77.00
	06/01/2025	\$42.92	\$14.91	\$20.17	\$0.00	\$78.00
	08/01/2025	\$42.92	\$15.41	\$20.17	\$0.00	\$78.50
	12/01/2025	\$42.92	\$15.41	\$21.78	\$0.00	\$80.11
	06/01/2026	\$43.92	\$15.41	\$21.78	\$0.00	\$81.11
	08/01/2026	\$43.92	\$15.91	\$21.78	\$0.00	\$81.61
	12/01/2026	\$43.92	\$15.91	\$23.52	\$0.00	\$83.35
TUNNEL WORK - COMPRESSED AIR <i>LABORERS (COMPRESSED AIR)</i>	12/01/2023	\$56.56	\$9.65	\$18.67	\$0.00	\$84.88
	06/01/2024	\$58.04	\$9.65	\$18.67	\$0.00	\$86.36
	12/01/2024	\$59.51	\$9.65	\$18.67	\$0.00	\$87.83
	06/01/2025	\$61.01	\$9.65	\$18.67	\$0.00	\$89.33
	12/01/2025	\$62.51	\$9.65	\$18.67	\$0.00	\$90.83
	06/01/2026	\$64.06	\$9.65	\$18.67	\$0.00	\$92.38
	12/01/2026	\$65.56	\$9.65	\$18.67	\$0.00	\$93.88
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) <i>LABORERS (COMPRESSED AIR)</i>	12/01/2023	\$58.56	\$9.65	\$18.67	\$0.00	\$86.88
	06/01/2024	\$60.04	\$9.65	\$18.67	\$0.00	\$88.36
	12/01/2024	\$61.51	\$9.65	\$18.67	\$0.00	\$89.83
	06/01/2025	\$63.01	\$9.65	\$18.67	\$0.00	\$91.33
	12/01/2025	\$64.51	\$9.65	\$18.67	\$0.00	\$92.83
	06/01/2026	\$66.06	\$9.65	\$18.67	\$0.00	\$94.38
	12/01/2026	\$67.56	\$9.65	\$18.67	\$0.00	\$95.88
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2023	\$48.63	\$9.65	\$18.67	\$0.00	\$76.95
	06/01/2024	\$50.11	\$9.65	\$18.67	\$0.00	\$78.43
	12/01/2024	\$51.58	\$9.65	\$18.67	\$0.00	\$79.90
	06/01/2025	\$53.08	\$9.65	\$18.67	\$0.00	\$81.40
	12/01/2025	\$54.58	\$9.65	\$18.67	\$0.00	\$82.90
	06/01/2026	\$56.13	\$9.65	\$18.67	\$0.00	\$84.45
	12/01/2026	\$57.63	\$9.65	\$18.67	\$0.00	\$85.95
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR (HAZ. WASTE) <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2023	\$50.63	\$9.65	\$18.67	\$0.00	\$78.95
	06/01/2024	\$52.11	\$9.65	\$18.67	\$0.00	\$80.43
	12/01/2024	\$53.58	\$9.65	\$18.67	\$0.00	\$81.90
	06/01/2025	\$55.08	\$9.65	\$18.67	\$0.00	\$83.40
	12/01/2025	\$56.58	\$9.65	\$18.67	\$0.00	\$84.90
	06/01/2026	\$58.13	\$9.65	\$18.67	\$0.00	\$86.45
	12/01/2026	\$59.63	\$9.65	\$18.67	\$0.00	\$87.95
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2023	\$40.34	\$14.41	\$18.67	\$0.00	\$73.42
	06/01/2024	\$41.34	\$14.41	\$18.67	\$0.00	\$74.42
	08/01/2024	\$41.34	\$14.91	\$18.67	\$0.00	\$74.92
	12/01/2024	\$41.34	\$14.91	\$20.17	\$0.00	\$76.42
	06/01/2025	\$42.34	\$14.91	\$20.17	\$0.00	\$77.42
	08/01/2025	\$42.34	\$15.41	\$20.17	\$0.00	\$77.92
	12/01/2025	\$42.34	\$15.41	\$21.78	\$0.00	\$79.53
	06/01/2026	\$43.34	\$15.41	\$21.78	\$0.00	\$80.53
	08/01/2026	\$43.34	\$15.91	\$21.78	\$0.00	\$81.03
	12/01/2026	\$43.34	\$15.91	\$23.52	\$0.00	\$82.77
WAGON DRILL OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
For apprentice rates see "Apprentice- LABORER"						
WAGON DRILL OPERATOR (HEAVY & HIGHWAY) <i>LABORERS - ZONE 1 (HEAVY & HIGHWAY)</i>	12/01/2023	\$44.58	\$9.65	\$18.07	\$0.00	\$72.30
	06/01/2024	\$46.06	\$9.65	\$18.07	\$0.00	\$73.78
	12/01/2024	\$47.53	\$9.65	\$18.07	\$0.00	\$75.25
	06/01/2025	\$49.03	\$9.65	\$18.07	\$0.00	\$76.75
	12/01/2025	\$50.53	\$9.65	\$18.07	\$0.00	\$78.25
	06/01/2026	\$52.08	\$9.65	\$18.07	\$0.00	\$79.80
	12/01/2026	\$53.58	\$9.65	\$18.07	\$0.00	\$81.30
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
WASTE WATER PUMP OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2023	\$55.03	\$15.00	\$16.40	\$0.00	\$86.43
	06/01/2024	\$56.33	\$15.00	\$16.40	\$0.00	\$87.73
	12/01/2024	\$57.78	\$15.00	\$16.40	\$0.00	\$89.18
	06/01/2025	\$59.08	\$15.00	\$16.40	\$0.00	\$90.48
	12/01/2025	\$60.53	\$15.00	\$16.40	\$0.00	\$91.93
	06/01/2026	\$61.83	\$15.00	\$16.40	\$0.00	\$93.23
	12/01/2026	\$63.28	\$15.00	\$16.40	\$0.00	\$94.68
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER <i>PLUMBERS & GASFITTERS LOCAL 12</i>	09/03/2023	\$66.44	\$14.07	\$18.86	\$0.00	\$99.37
	03/03/2024	\$68.24	\$14.07	\$18.86	\$0.00	\$101.17
	09/01/2024	\$70.04	\$14.07	\$18.86	\$0.00	\$102.97
	03/02/2025	\$71.34	\$14.32	\$19.11	\$0.00	\$104.77
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$29.67	\$9.25	\$1.89	\$0.00	\$40.81
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	08/30/2020	\$42.03	\$9.25	\$10.27	\$0.00	\$61.55

Classification		Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LINEMAN"							
DRIVER / GROUNDMAN CDL <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>		08/30/2020	\$34.62	\$9.25	\$10.07	\$0.00	\$53.94
For apprentice rates see "Apprentice- LINEMAN"							
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>		08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
For apprentice rates see "Apprentice- LINEMAN"							
EQUIPMENT OPERATOR (Class A CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>		08/30/2020	\$42.03	\$9.25	\$14.35	\$0.00	\$65.63
For apprentice rates see "Apprentice- LINEMAN"							
EQUIPMENT OPERATOR (Class B CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>		08/30/2020	\$37.09	\$9.25	\$10.87	\$0.00	\$57.21
For apprentice rates see "Apprentice- LINEMAN"							
GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>		08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
For apprentice rates see "Apprentice- LINEMAN"							
GROUNDMAN -Inexperienced (<2000 Hrs.) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>		08/30/2020	\$22.25	\$9.25	\$1.82	\$0.00	\$33.32
For apprentice rates see "Apprentice- LINEMAN"							
JOURNEYMAN LINEMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>		08/30/2020	\$49.45	\$9.25	\$17.48	\$0.00	\$76.18

Apprentice - LINEMAN (Outside Electrical) - East Local 104

Effective Date - 08/30/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$29.67	\$9.25	\$3.39	\$0.00	\$42.31
2	65	\$32.14	\$9.25	\$3.46	\$0.00	\$44.85
3	70	\$34.62	\$9.25	\$3.54	\$0.00	\$47.41
4	75	\$37.09	\$9.25	\$5.11	\$0.00	\$51.45
5	80	\$39.56	\$9.25	\$5.19	\$0.00	\$54.00
6	85	\$42.03	\$9.25	\$5.26	\$0.00	\$56.54
7	90	\$44.51	\$9.25	\$7.34	\$0.00	\$61.10

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$30.73	\$4.70	\$3.17	\$0.00	\$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/04/2019	\$28.93	\$4.70	\$3.14	\$0.00	\$36.77

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)

Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.

*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.

**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

SECTION 00830

ATTACHMENT B

Excerpts from Chapters 30, 82 and 149 of the Massachusetts General Laws

NOTICE - These are **NOT** the official versions of the Massachusetts General Laws (MGL). While reasonable efforts have been made to assure the accuracy of the excerpts provided, do not rely on this information without first checking an official edition of the MGL. If you are in need of legal advice or counsel, consult a lawyer. These excerpts include amendments to the General Laws passed before January 4, 2023. For laws enacted since that time, see the 2023 Session Laws.

CERTAIN EXCERPTS FROM THE MASSACHUSETTS GENERAL LAWS ARE APPLICABLE TO CONSTRUCTION CONTRACTS. ATTENTION IS DIRECTED TO THE FOLLOWING SECTIONS OF CHAPTER 149 AS AMENDED.

Section 25. LODGING, BOARD AND TRADE OF PUBLIC EMPLOYEES; STATUTE PART OF EMPLOYMENT CONTRACT.

"Every employee in public work shall lodge, board, and trade where and with whom he elects; and no person or his agents or employees under contract with the commonwealth, a county, city or town, or with a department, board, commission or officer acting therefor, for the doing of public work shall directly or indirectly require, as a condition of employment therein, that the employee shall lodge, board or trade at a particular place or with a particular person. This section shall be made a part of the contract for such employment."

Section 26. PUBLIC WORKS; PREFERENCE TO VETERANS AND CITIZENS; WAGES.

"In the employment of mechanics and apprentices, teamsters, chauffeurs and laborers in the construction of public works by the commonwealth, or by a county, town, authority or district, or by persons contracting or subcontracting for such works, preference shall first be given to citizens of the commonwealth who have been residents of the commonwealth for at least six months at the commencement of their employment who are veterans as defined in clause Forty-third of section 7 of chapter 4 and who are qualified to perform the work to which the employment relates and, within such preference, preference shall be given to service-disabled veterans; and secondly, to citizens of the commonwealth generally who have been residents of the commonwealth for at least six months at the commencement of their employment, and if they cannot be obtained in sufficient numbers, then to citizens of the United States, and every contract for such work shall contain a provision to this effect..."

Section 34. PUBLIC CONTRACTS; STIPULATION AS TO HOURS AND DAYS OF WORK; VOID CONTRACTS.

"Every contract, except for the purchase of material or supplies, involving the employment of laborers, workmen, mechanics, foremen or inspectors, to which the commonwealth or any county or any town, subject to section thirty, is a party, shall contain a stipulation that no laborer, workman, mechanic, foreman or inspector working within the commonwealth, in the employ of the contractor, subcontractor or other person doing or contracting to do the whole or a part of the work contemplated by the contract, shall be required or permitted to work more than eight hours in any one day or more

than forty-eight hours in any one week, or more than six days in any one week, except in cases of emergency, or, in case any town subject to section thirty-one is a party to such a contract, more than eight hours in any one day, except as aforesaid..."

Section 34A. CONTRACTS FOR PUBLIC WORKS; WORKERS' COMPENSATION INSURANCE; BREACH OF CONTRACT; ENFORCEMENT AND VIOLATION OF STATUTE.

"Every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or other public works for the commonwealth or any political subdivision thereof shall contain stipulations requiring that the contractor shall, before commencing performance of such contract, provide by insurance for the payment of compensation and the furnishing of other benefits under chapter one hundred and fifty-two to all persons to be employed under the contract, and that the contractor shall continue such insurance in full force and effect during the term of the contract. No officer or agent contracting in behalf of the commonwealth or any political subdivision thereof shall award such a contract until he has been furnished with sufficient proof of compliance with the aforesaid

stipulations. Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of the contract and shall operate as an immediate termination thereof. No cancellation of such insurance, whether by the insurer or by the insured, shall be valid unless written notice thereof is given by the party proposing cancellation to the other party and to the officer or agent who awarded the contract at least fifteen days prior to the intended effective date thereof, which date shall be expressed in said notice. Notice of cancellation sent by the party proposing cancellation by registered mail, postage prepaid, with a return receipt of the addressee requested, shall be a sufficient notice..."

Section 34B. CONTRACTS FOR PUBLIC WORKS; WAGES FOR RESERVE POLICE OFFICER.

"Every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public works for the commonwealth or any political subdivision thereof shall contain stipulations requiring that the contractor shall pay to any reserve police officer employed by him in any city or town the prevailing rate of wage paid to regular police officers in such city or town."

Whenever general bids are invited for a contract subject to Section 44A, the following provision applies:

Section 44E. FILING OF BIDS; FORMS; MODULAR BUILDINGS. Second paragraph of subdivision (2), clause E.

"The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards made subject to section 44A."

For projects estimated to cost more than \$25,000, the following provision applies to sub-bidders:

Section 44F. PLANS AND SPECIFICATIONS; SUB-BIDS; FORM; CONTENTS. First paragraph of

clause I of subdivision (2) of section 44F.

"The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards of subcontracts subject to section 44F."

Section 44G. ALLOWANCES; ALTERNATES; WEATHER PROTECTION DEVICES.

(A) "Allowance" as used herein means a sum of money covering one or more items of labor or labor and materials which is designated in bid documents and which general bidders are required to use in computing their bids. The use of such allowances shall be prohibited in the award of any contract subject to the provisions of section forty-four A. Whenever the designer is unable to supply specifications for any item prior to the solicitation of bids, such item shall not be included in any contract subject to the provisions of section forty-four A. The awarding authority shall solicit bids for every such item separately pursuant to the provisions of section forty-four A after specifications for that item are prepared.

(B) Every alternate contained in the form for general bids shall be listed in a numerical sequence in order of priority. When the awarding authority decides to consider alternates in determining the lowest eligible and responsible bidder, the awarding authority shall consider the alternates in descending numerical sequence, such that no single alternate shall be considered unless every alternate preceding it on the list has been added to or subtracted from the base bid price.

(C) The use of options other than alternates in bid documents or bid forms subject to section forty-four A shall be prohibited under all circumstances.

(D) Every contract subject to section forty-four A shall include specifications for the installation of weather protection and shall require that the contractor shall install the same and that he shall furnish adequate heat in the area so protected during the months of November through March. Standards for such specifications shall be established by the commissioner or his designee."

Section 44J. INVITATIONS TO BID; NOTICE; CONTENTS; VIOLATIONS; PENALTY.

"(1) No public agency or authority of the commonwealth or any political subdivision thereof shall award any contract for which competitive bids are required pursuant to section forty-four A of this chapter or section thirty-nine M of chapter thirty, or for which competitive proposals are required pursuant to subsection (4) of section forty-four E of this chapter or section eleven C of chapter twenty-five A, unless a notice inviting bids or proposals therefor shall have been posted no less than one week prior to the time specified in such notice for the receipt of said bids or proposals in a conspicuous place in or near the offices of the awarding authority, and shall have remained posted until the time so specified, and unless such notice shall also have been published at least once not less than two weeks prior to the time so specified in the central register published by the secretary of state pursuant to section twenty A of chapter nine and in a newspaper of general circulation in the locality of the proposed project, and on the COMMBUYS system administered by the operational services division. Said notice shall also be published at such other times and in such other newspapers or trade periodicals as the commissioner of capital asset management and maintenance may require, having

regard to the locality of the work involved.

(2) Said notice shall specify the time and place where plans and specifications of the proposed work may be had; the time and place of submission of general bids; and the time and place for opening of the general bids. For contracts subject to the provisions of section forty-four A to H, inclusive, of this chapter, said notice shall also specify the time and place for submission of filed sub-bids, where required pursuant to section forty-four F; and the time and place for opening of said filed sub-bids.

Said notice shall also provide sufficient facts concerning the nature and scope of such project, the type and elements of construction, and such other information as will assist applicants in deciding to bid on such contract.

(3) No contract or preliminary plans and specifications shall be split or divided for the purpose of evading the provisions of this section.

(4) General bids and filed sub-bids for any contract subject to this section shall be in writing and shall be opened in public at the time and place specified in the posted or published notice, and after being so opened shall be open to public inspection.

(5) The provisions of this section shall not apply to any transaction between the commonwealth and any public service corporation.

(6) The provisions of this section may be waived in cases of extreme emergency involving the health and safety of the people and their property, upon the written approval of said commissioner. The written approval shall contain a description of the circumstances and the reasons for the commissioner's determination.

(7) Whoever violates any provision of this section shall be punished by a fine of not more than ten thousand dollars or by imprisonment in the state prison for not more than three years or in a jail or house of correction for not more than two and one-half years, or by both said fine and imprisonment; and in the event of final conviction, said person shall be incapable of holding any office of honor, trust or profit under the commonwealth or under any county, district or municipal agency.

Each and every person who shall cause or conspire to cause any contract or preliminary plans and specifications to be split or divided for the purpose of evading the provisions of this section shall forfeit and pay to the commonwealth, a political subdivision thereof or other awarding authority subject to this section, the sum of not more than five thousand dollars and, in addition, such person or persons shall pay, apportioned among them, double the amount of damages which the commonwealth or political subdivision thereof or other awarding authority may have sustained by reason of the doing of such act, together with the costs of the action.

(8) If an awarding authority rejects all general bids or does not receive any general bids, and advertises for a second opening of general bids with the original filed sub-bids as set forth in subsection (1) of section forty-four E the notice for receipt of such general bids may be published in the central register and elsewhere as required not less than one week prior to the time specified for such second opening of general bids.

(9) No request for proposals or invitation for bids issued under sections 38A ½ to 38O, inclusive, of chapter 7, section 11C of chapter 25A, section 39M of chapter 30, this section and sections 44A to 44H, inclusive, shall be advertised if the awarding authority's cost estimate is greater than 1 year old."

Attention is directed to the following sections of Chapter 30 of the General Laws of Massachusetts as amended to date.

Section 38A. PRICE ADJUSTMENT CLAUSE IN CONTRACTS FOR ROAD, BRIDGE, WATER AND SEWER PROJECTS AWARDED UNDER SEC. 39M

"Contracts for road and bridge projects awarded as a result of a proposal or invitation for bids under section 39M shall include a price adjustment clause for each of the following materials: fuel, both diesel and gasoline; asphalt; concrete; and steel. Contracts for water and sewer projects awarded as a result of a proposal or invitation for bids under said section 39M shall include a price adjustment clause for fuel, both diesel and gasoline; liquid asphalt; and portland cement contained in cast-in-place concrete. A base price for each material shall be set by the awarding authority or agency and shall be included in the bid documents at the time the project is advertised. The awarding authority or agency shall also identify in the bid documents the price index to be used for each material. The price adjustment clause shall provide for a contract adjustment to be made on a monthly basis when the monthly cost change exceeds plus or minus 5 per cent."

Section 39F. CONSTRUCTION CONTRACTS; ASSIGNMENT AND SUBROGATION; SUBCONTRACTOR DEFINED; ENFORCEMENT OF CLAIM FOR DIRECT PAYMENT; DEPOSIT; REDUCTION OF DISPUTED AMOUNTS.

(1) "Every contract awarded pursuant to sections forty-four A to L inclusive, of chapter one hundred and forty-nine shall contain the following subparagraphs (a) through (i) and every contract awarded pursuant to section thirty-nine M of chapter thirty shall contain the following subparagraphs (a) through (h) and in each case those subparagraphs shall be binding between the general contractor and each subcontractor.

(a) Forthwith after the general contractor receives payment on account of a periodic estimate, the general contractor shall pay to each subcontractor the amount paid for the labor performed and the materials furnished by that subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.

(b) Not later than the sixty-fifth day after each subcontractor substantially completes his work in accordance with the plans and specifications, the entire balance due under the subcontract less amounts retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the subcontractor; and the awarding authority shall pay that amount to the general contractor. The general contractor shall forthwith pay to the subcontractor the full amount received from the awarding authority less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the subcontractor by the general contractor.

(c) Each payment made by the awarding authority to the general contractor pursuant to subparagraphs (a) and (b) of this paragraph for the labor performed and the materials furnished by a subcontractor shall be made to the general contractor for the account of that subcontractor; and the awarding authority shall take reasonable steps to compel the general contractor to make each such payment to each such subcontractor. If the awarding authority has received a demand for direct payment from a subcontractor for any amount which has already been included in a payment to the general contractor or which is to be included in a payment to the general contractor for payment to the subcontractor as provided in subparagraphs (a) and (b), the awarding authority shall act upon the demand as provided in this section.

(d) If, within seventy days after the subcontractor has substantially completed the subcontract work, the subcontractor has not received from the general contractor the balance due under the

subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount retained by the awarding authority as the estimated cost of completing the incomplete and unsatisfactory items of work, the subcontractor may demand direct payment of that balance from the awarding authority. The demand shall be by a sworn statement delivered to or sent by certified mail to the awarding authority, and a copy shall be delivered to or sent by certified mail to the general contractor at the same time. The demand shall contain a detailed breakdown of the balance due under the subcontract and also a statement of the status of completion of the subcontract work. Any demand made after substantial completion of the subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the subcontractor has substantially completed the subcontract work. Within ten days after the subcontractor has delivered or so mailed the demand to the awarding authority and delivered or so mailed a copy to the general contractor, the general contractor may reply to the demand. The reply shall be by a sworn statement delivered to or sent by certified mail to the awarding authority and a copy shall be delivered to or sent by certified mail to the subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor and of the amount due for each claim made by the general contractor against the subcontractor.

(e) Within fifteen days after receipt of the demand by the awarding authority, but in no event prior to the seventieth day after substantial completion of the subcontract work, the awarding authority shall make direct payment to the subcontractor of the balance due under the subcontract including any amount due for extra labor and materials furnished to the general contractor, less any amount (i) retained by the awarding authority as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the general contractor in the sworn reply; provided, that the awarding authority shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by subparagraph (d). The awarding authority shall make further direct payments to the subcontractor forthwith after the removal of the basis for deductions from direct payments made as provided in parts (i) and (ii) of this subparagraph.

(f) The awarding authority shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of subparagraph (e) in an interest-bearing joint account in the names of the general contractor and the subcontractor in a bank in Massachusetts selected by the awarding authority or agreed upon by the general contractor and the subcontractor and shall notify the general contractor and the subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the general contractor and the subcontractor or as determined by decree of a court of competent jurisdiction.

(g) All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to subparagraph (f) shall be made out of amounts payable to the general contractor at the time of receipt of a demand for direct payment from a subcontractor and out of amounts which later become payable to the general contractor and in the order of receipt of such demands from subcontractors. All direct payments shall discharge the obligation of the awarding authority to the general contractor to the extent of such payment.

(h) The awarding authority shall deduct from payments to a general contractor amounts which, together with the deposits in interest-bearing accounts pursuant to subparagraph (f), are sufficient to satisfy all unpaid balances of demands for direct payment received from subcontractors. All such amounts shall be earmarked for such direct payments, and the subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the general contractor.

(i) If the subcontractor does not receive payment as provided in subparagraph (a) or if the general contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the subcontractor and the subcontractor does not receive payment for same when due less the deductions provided for in subparagraph (a), the subcontractor may demand direct payment by following the procedure in subparagraph (d) and the general contractor may file a sworn reply as provided in that same subparagraph. A demand made after the first day of the month following that for which the subcontractor performed or furnished the labor and materials for which the subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the general contractor. Thereafter the awarding authority shall proceed as provided in subparagraph (e), (f), (g), and (h).

(2) Any assignment by a subcontractor of the rights under this section to a surety company furnishing a bond under the provisions of section twenty-nine of chapter one hundred forty-nine shall be invalid. The assignment and subrogation rights of the surety to amounts included in a demand for direct payment which are in the possession of the awarding authority or which are on deposit pursuant to subparagraph (f) of paragraph (1) shall be subordinate to the rights of all subcontractors who are entitled to be paid under this section and who have not been paid in full.

(3) "Subcontractor" as used in this section (i) for contracts awarded as provided in sections forty-four A to forty-four H, inclusive, of chapter one hundred forty-nine shall mean a person who files a sub-bid and receives a subcontract as a result of that filed sub-bid or who is approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, (ii) for contracts awarded as provided in paragraph (a) of section thirty-nine M of chapter thirty shall mean a person approved by the awarding authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the general contractor, and (iii) for contracts with the commonwealth not awarded as provided in forty-four A to forty-four H, inclusive, of chapter one hundred forty-nine shall also mean a person contracting with the general contractor to supply materials used or employed in a public works project for a price in excess of five thousand dollars.

(4) A general contractor or a subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposited as provided in subparagraph (f) of paragraph 1 by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in subparagraph (f) of paragraph 1 by a petition in equity in the superior court against the awarding authority and the general contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this paragraph. Sections fifty-nine and fifty-nine B of chapter two hundred thirty-one shall apply to such petitions. The court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to sections fifty-nine and fifty-nine B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal therefrom as from a final decree. The court shall not consolidate for trial the

petition of any subcontractor with the petition of one or more subcontractors or the same general contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a subcontractor filing a demand for direct payment for which no funds due the general contractor are available for direct payment shall have a right to file a petition in court of equity against the awarding authority claiming a demand for direct payment is premature and such subcontractor must file the petition before the awarding authority has made a direct payment to the subcontractor and has made a deposit of the disputed portion as provided in part (iii) of subparagraph (e) and in subparagraph (f) of paragraph (1).

(5) In any petition to collect any claim for which a subcontractor has filed a demand for direct payment the court shall, upon motion of the general contractor, reduce by the amount of any deposit of a disputed amount by the awarding authority as provided in part (iii) of subparagraph (e) and in subparagraph (f) of paragraph (1) any amount held under a trustee writ or pursuant to a restraining order or injunction."

Section 39G. COMPLETION OF PUBLIC WORKS; SEMI-FINAL AND FINAL ESTIMATES; PAYMENTS; EXTRA WORK; DISPUTED ITEMS.

"Upon substantial completion of the work required by a contract with the commonwealth, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges and other highway structures, sewers and water mains, airports and other public works, the contractor shall present in writing to the awarding authority its certification that the work has been substantially completed. Within twenty-one days thereafter, the awarding authority shall present to the contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The awarding authority may include with such list a notice setting forth a reasonable time, which shall not in any event be prior to the contract completion date, within which the contractor must achieve substantial completion of the work. In the event that the awarding authority fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the contractor's certification within the twenty-one-day period, the contractor's certification shall take effect as the awarding authority's declaration that the work has been substantially completed.

Within sixty-five days after the effective date of a declaration of substantial completion, the awarding authority shall prepare and forthwith send to the contractor for acceptance a substantial completion estimate for the quantity and price of the work done and all but one percent retainage, if held by the awarding authority, on that work, including the quantity, price and all but one percent retainage, if held by the awarding authority, for the undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory work items and less the total periodic payments made to date for the work. The awarding authority also shall deduct from the substantial completion estimate an amount equal to the sum of all demands for direct payment filed by subcontractors and not yet paid to subcontractors or deposited in joint accounts pursuant to section thirty-nine F, but no contract subject to said section thirty-nine F shall contain any other provision authorizing the awarding authority to deduct any amount by virtue of claims asserted against the contract by subcontractors, material suppliers or others.

If the awarding authority fails to prepare and send to the contractor any substantial completion estimate required by this section on or before the date herein above set forth, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such substantial completion estimate at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the awarding authority sends that substantial completion estimate to the contractor for acceptance or to the date of payment therefor, whichever occurs first. The awarding authority shall include the amount of such interest in the substantial completion estimate.

Within fifteen days after the effective date of the declaration of substantial completion, the awarding authority shall send to the contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items, and, unless delayed by causes beyond his control, the contractor shall complete all such work items within forty-five-days after the receipt of such list or before the then contract completion date, whichever is later. If the contractor fails to complete such work within such time, the awarding authority may, subsequent to seven days' written notice to the contractor by certified mail, return receipt requested, terminate the contract and complete the incomplete or unsatisfactory work items and charge the cost of same to the contractor.

Within thirty days after receipt by the awarding authority of a notice from the contractor stating that all of the work required by the contract has been completed, the awarding authority shall prepare and forthwith send to the contractor for acceptance a final estimate for the quantity and price of the work done and all retainage, if held by the awarding authority, on that work less all payments made to date, unless the awarding authority's inspection shows that work items required by the contract remain incomplete or unsatisfactory, or that documentation required by the contract has not been completed. If the awarding authority fails to prepare and send to the contractor the final estimate within thirty days after receipt of notice of completion, the awarding authority shall pay to the contractor interest on the amount which would have been due to the contractor pursuant to such final estimate at the rate hereinabove provided from the thirtieth day after such completion until the date on which the awarding authority sends the final estimate to the contractor for acceptance or the date of payment therefor, whichever occurs first, provided that the awarding authority's inspection shows that no work items required by the contract remain incomplete or unsatisfactory. Interest shall not be paid hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinabove provided. The awarding authority shall include the amount of the interest required to be paid hereunder in the final estimate.

The awarding authority shall pay the amount due pursuant to any substantial completion or final estimate within thirty-five days after receipt of written acceptance for such estimate from the contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth day to the date of payment.

Within 15 days, 30 days in the case of the commonwealth, after receipt from the contractor, at the place designated by the awarding authority, if such place is so designated, of a periodic estimate requesting payment of the amount due for the preceding periodic estimate period, the awarding authority shall make a periodic payment to the contractor for the work performed during the preceding periodic estimate period and for the materials not incorporated in the work but delivered and suitably stored at the site, or at some location agreed upon in writing, to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances. The awarding authority shall include with each such payment interest on

the amount due pursuant to such periodic estimate at the rate herein above provided from the due date. In the case of periodic payments, the contracting authority may deduct from its payment a retention based on its estimate of the fair value of its claims against the contractor, a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and a retention to secure satisfactory performance of the contractual work not exceeding five per cent of the approved amount of any periodic payment, and the same right to retention shall apply to bonded subcontractors entitled to direct payment under section thirty-nine F of chapter thirty; provided, that a five per cent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

No periodic, substantial completion or final estimate or acceptance or payment thereof shall bar a contractor from reserving all rights to dispute the quantity and amount of, or the failure of the awarding authority to approve a quantity and amount of, all or part of any work item or extra work item.

Substantial completion, for the purposes of this section, shall mean either that the work required by the contract has been completed except for work having a contract price of less than one percent of the then adjusted total contract price, or substantially all of the work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work required by the contract."

Section 39I. DEVIATIONS FROM PLANS AND SPECIFICATIONS.

"Every contractor having a contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the commonwealth, or of any political subdivision thereof, shall perform all the work required by such contract in conformity with the plans and specifications contained therein. No wilful and substantial deviation from said plans and specifications shall be made unless authorized in writing by the awarding authority or by the engineer or architect in charge of the work who is duly authorized by the awarding authority to approve such deviations. In order to avoid delays in the prosecution of the work required by such contract such deviation from the plans or specifications may be authorized by a written order of the awarding authority or such engineer or architect so authorized to approve such deviation. Within thirty days thereafter, such written order shall be confirmed by a certificate of the awarding authority stating: (1) if such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination, and, if the deviation is of any other nature, the reasons for such deviation, giving justification therefor; (2) that the specified deviation does not materially injure the project as a whole; (3) that either the work substituted for the work specified is of the same cost and quality, or that an equitable adjustment has been agreed upon between the contracting agency and the contractor and the amount in dollars of said adjustment; and (4) that the deviation is in the best interest of the contracting authority.

Such certificate shall be signed under the penalties of perjury and shall be a permanent part of the file record of the work contracted for.

Whoever violates any provision of this section wilfully and with intent to defraud shall be punished by a fine of not more than five thousand dollars or by imprisonment for not more than six months, or both."

Section 39J. PUBLIC CONSTRUCTION CONTRACTS; EFFECT OF DECISIONS OF CONTRACTING BODY OR ADMINISTRATIVE BOARD.

"Notwithstanding any contrary provision of any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or public works by the commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount of the contract is more than five thousand dollars in the case of the commonwealth and more than two thousand dollars in the case of any county, city, town, district, board, commission or other public body, a decision, by the contracting body or by any administrative board, official or agency, or by any architect or engineer, on a dispute, whether of fact or of law, arising under said contract shall not be final or conclusive if such decision is made in bad faith, fraudulently, capriciously, or arbitrarily is unsupported by substantial evidence, or is based upon error of law."

Section 39K. PUBLIC BUILDING CONSTRUCTION CONTRACTS; PAYMENTS.

"Every contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building by the commonwealth, or by any county, city, town, district, board, commission or other public body, when the amount is more than five thousand dollars in the case of the commonwealth and more than two thousand dollars in the case of any county, city, town, district, board, commission or other public body, shall contain the following paragraph: Within fifteen days (30 days in the case of the commonwealth, including local housing authorities) after receipt from the contractor, at the place designated by the awarding authority if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the awarding authority will make a periodic payment to the contractor for the work performed during the preceding month and for the materials not incorporated in the work but delivered and suitably stored at the site (or at some location agreed upon in writing) to which the contractor has title or to which a subcontractor has title and has authorized the contractor to transfer title to the awarding authority, upon certification by the contractor that he is the lawful owner and that the materials are free from all encumbrances, but less (1) a retention based on its estimate of the fair value of its claims against the contractor and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and less (3) a retention not exceeding five percent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five-days after (a) the contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the awarding authority, less than one percent of the original contract price, or (b) the contractor substantially completes the work and the awarding authority takes possession for occupancy, whichever occurs first, the awarding authority shall pay the contractor the entire balance due on the contract less (1) a retention based on its estimate of the fair value of its claims against the contractor and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, or based on the record of payments by the contractor to the subcontractors under this contract if such record of payment indicates that the contractor has not paid subcontractors as provided in section thirty-nine F. If the awarding authority fails to make payment as herein provided, there shall be added to each such payment daily interest at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen days (twenty-four days in the case of the commonwealth) after receipt of such a periodic estimate from the contractor, at the place designated by the awarding authority if such a place is so designated. The contractor agrees to pay to each subcontractor a portion of any such interest paid in accordance with the amount due each subcontractor.

The awarding authority may make changes in any periodic estimate submitted by the contractor and the payment due on said periodic estimate shall be computed in accordance with the changes so made, but such changes or any requirement for a corrected periodic estimate shall not affect the due date for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment computed in accordance with the changes made, as provided herein; provided, that the awarding authority may, within seven days after receipt, return to the contractor for correction, any periodic estimate which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt of such periodic estimate shall be the date of receipt of the corrected periodic estimate in proper form and with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday shall be the first working day thereafter. The provisions of section thirty-nine G shall not apply to any contract for the construction, reconstruction, alteration, remodeling, repair or demolition of any public building to which this section applies.

All periodic estimates shall be submitted to the awarding authority, or to its designee as set forth in writing to the contractor, and the date of receipt by the awarding authority or its designee shall be marked on the estimate. All periodic estimates shall contain a separate item for each filed subtrade and each sub-subtrade listed in sub-bid form as required by specifications and a column listing the amount paid to each subcontractor and sub-subcontractor as of the date the periodic estimate is filed. The person making payment for the awarding authority shall add the daily interest provided for herein to each payment for each day beyond the due date based on the date of receipt marked on the estimate.

A certificate of the architect to the effect that the contractor has fully or substantially completed the work shall, subject to the provisions of section thirty-nine J, be conclusive for the purposes of this section.

Notwithstanding the provisions of this section, at any time after the value of the work remaining to be done is, in the estimation of the awarding authority, less than 1 per cent of the adjusted contract price, or the awarding authority has determined that the contractor has substantially completed the work and the awarding authority has taken possession for occupancy, the awarding authority may send to the general contractor by certified mail, return receipt requested, a complete and final list of all incomplete and unsatisfactory work items, including, for each item on the list, a good faith estimate of the fair and reasonable cost of completing such item. The general contractor shall then complete all such work items within 30 days of receipt of such list or before the contract completion date, whichever is later. If the general contractor fails to complete all incomplete and unsatisfactory work items within 45 days after receipt of such items furnished by the awarding authority or before the contract completion date, whichever is later, subsequent to an additional 14 days' written notice to the general contractor by certified mail, return receipt requested, the awarding authority may terminate the contract and complete the incomplete and unsatisfactory work items and charge the cost of same to the general contractor and such termination shall be without prejudice to any other rights or remedies the awarding authority may have under the contract. The awarding authority shall note any such termination in the evaluation form to be filed by the awarding authority pursuant to the provisions of section 44D of chapter 149."

Section 39L. PUBLIC CONSTRUCTION WORK BY FOREIGN CORPORATIONS; RESTRICTIONS AND REPORTS.

"The commonwealth and every county, city, town, district, board, commission or other public body which, as the awarding authority, requests proposals, bids or sub-bids for any work in the construction, reconstruction, alteration, remodeling, repair or demolition of any public building or other

public works (1) shall not enter into a contract for the work with, and shall not approve as a subcontractor furnishing labor and materials for a part of the work, a foreign corporation which has not filed with such awarding authority a certificate of the state secretary stating that the corporation has complied with requirements of section 15.03 of subdivision A of Part 15 of chapter 156D and the date of compliance, and further has filed all annual reports required by section 16.22 of subdivision B of Part 16 of said chapter 156D, and (2) shall report to the state secretary and to the department of corporations and taxation any foreign corporation performing work under such contract or subcontract, and any person, other than a corporation, performing work under such contract or subcontract, and residing or having a principal place of business outside the commonwealth."

Section 39M. CONTRACTS FOR CONSTRUCTION AND MATERIALS; MANNER OF AWARDING.

"(b) Specifications for such contracts, and specifications for contracts awarded pursuant to the provisions of said sections forty-four A to forty-four L of said chapter one hundred and forty-nine, shall be written to provide for full competition for each item of material to be furnished under the contract; except, however, that said specifications may be otherwise written for sound reasons in the public interest stated in writing in the public records of the awarding authority or promptly given in writing by the awarding authority to anyone making a written request therefor, in either instance such writing to be prepared after reasonable investigation. Every such contract shall provide that an item equal to that named or described in the said specifications may be furnished; and an item shall be considered equal to the item so named or described if, in the opinion of the awarding authority: (1) it is at least equal in quality, durability, appearance, strength and design, (2) it will perform at least equally the function imposed by the general design for the public work being contracted for or the material being purchased, and (3) it conforms substantially, even with deviations, to the detailed requirements for the item in the said specifications. For each item of material the specifications shall provide for either a minimum of three named brands of material or a description of material which can be met by a minimum of three manufacturers or producers, and for the equal of any one of said named or described materials."

For projects estimated to cost more than \$10,000, the following provision, section 39M subsection c, applies:

"(c) The term "lowest responsible and eligible bidder" shall mean the bidder: (1) whose bid is the lowest of those bidders possessing the skill, ability and integrity necessary for the faithful performance of the work; (2) who shall certify, that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work; (3) who shall certify that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; (4) who, where the provisions of section 8B of chapter 29 apply, shall have been determined to be qualified thereunder; and (5) who obtains within 10 days of the notification of contract award the security by bond required under section 29 of chapter 149; provided that for the purposes of this section the term "security by bond" shall mean the bond of a surety company qualified to do business under the laws of the commonwealth and satisfactory to the awarding authority; provided further, that if there is more than 1 surety company, the surety companies shall be jointly and severally liable."

Section 39N. CONSTRUCTION CONTRACTS; EQUITABLE ADJUSTMENT IN CONTRACT PRICE

FOR DIFFERING SUBSURFACE OR LATENT PHYSICAL CONDITIONS.

"Every contract subject to section forty-four A of chapter one hundred and forty-nine or subject to section thirty-nine M of chapter thirty shall contain the following paragraph in its entirety and an awarding authority may adopt reasonable rules or regulations in conformity with that paragraph concerning the filing, investigation and settlement of such claims:

If, during the progress of the work, the contractor or the awarding authority discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the contract documents either the contractor or the contracting authority may request an equitable adjustment in the contract price of the contract applying to work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a contractor, or upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the contract documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the plans and contract documents and are of such a nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the contracting authority shall make an equitable adjustment in the contract price and the contract shall be modified in writing accordingly."

Section 39O. CONTRACTS FOR CONSTRUCTION AND MATERIALS; SUSPENSION, DELAY OR INTERRUPTION DUE TO ORDER OF AWARDING AUTHORITY; ADJUSTMENT IN CONTRACT PRICE; WRITTEN CLAIM.

"Every contract subject to the provisions of section thirty-nine M of this chapter or subject to section forty-four A of chapter one hundred forty-nine shall contain the following provisions (a) and (b) in their entirety and, in the event a suspension, delay, interruption or failure to act of the awarding authority increases the cost of performance to any subcontractor, that subcontractor shall have the same rights against the general contractor for payment for an increase in the cost of his performance as provisions (a) and (b) give the general contractor against the awarding authority, but nothing in provisions (a) and (b) shall in any way change, modify or alter any other rights which the general contractor or the subcontractor may have against each other.

(a) The awarding authority may order the general contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as it may determine to be appropriate for the convenience of the awarding authority; provided however, that if there is a suspension, delay or interruption for fifteen days or more or due to a failure of the awarding authority to act within the time specified in this contract, the awarding authority shall make an adjustment in the contract price for any increase in the cost of performance of this contract but shall not include any profit to the general contractor on such increase; and provided further, that the awarding authority shall not make any adjustment in the contract price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which this contract provides for an equitable adjustment of the contract price under any other contract provisions.

(b) The general contractor must submit the amount of a claim under provision (a) to the awarding authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this contract and, except for

costs due to a suspension order, the awarding authority shall not approve any costs in the claim incurred more than twenty days before the general contractor notified the awarding authority in writing of the act or failure to act involved in the claim."

Section 39P. CONTRACTS FOR CONSTRUCTION AND MATERIALS; AWARDING AUTHORITY'S DECISIONS ON INTERPRETATION OF SPECIFICATIONS, ETC.; TIME LIMIT; NOTICE.

"Every contract subject to section thirty-nine M of this chapter or section forty-four A of chapter one hundred forty-nine which requires the awarding authority, any official, its architect or engineer to make a decision on interpretation of the specifications, approval of equipment, material or any other approval, or progress of the work, shall require that the decision be made promptly and, in any event, no later than thirty days after the written submission for decision; but if such decision requires extended investigation and study, the awarding authority, the official, architect or engineer shall, within thirty days after the receipt of the submission, give the party making the submission written notice of the reasons why the decision cannot be made within the thirty day period and the date by which the decision will be made."

Section 39Q. CONTRACTS FOR CAPITAL FACILITY CONSTRUCTION; CONTENTS; ANNUAL CLAIMS REPORT.

"(1) Every contract awarded by any state agency as defined by section thirty-nine A of chapter seven for the construction, reconstruction, alteration, remodeling, repair or demolition of any capital facility as defined by the aforesaid section thirty-nine A shall contain the following subparagraphs (a) through (d) in their entirety:

(a) Disputes regarding changes in and interpretations of the terms or scope of the contract and denials of or failures to act upon claims for payment for extra work or materials shall be resolved according to the following procedures, which shall constitute the exclusive method for resolving such disputes. Written notice of the matter in dispute shall be submitted promptly by the claimant to the chief executive official of the state agency which awarded the contract or his designee. No person or business entity having a contract with a state agency shall delay, suspend, or curtail performance under that contract as a result of any dispute subject to this section. Any disputed order, decision or action by the agency or its authorized representative shall be fully performed or complied with pending resolution of the dispute.

(b) Within thirty days of submission of the dispute to the chief executive official of the state agency or his designee, he shall issue a written decision stating the reasons therefor, and shall notify the parties of their right of appeal under this section. If the official or his designee is unable to issue a decision within thirty days, he shall notify the parties to the dispute in writing of the reasons why a decision cannot be issued within thirty days and of the date by which the decision shall issue. Failure to issue a decision within the thirty-day period or within the additional time period specified in such written notice shall be deemed to constitute a denial of the claim and shall authorize resort to the appeal procedure described below. The decision of the chief executive official or his designee shall be final and conclusive unless an appeal is taken as provided below.

(c) Within twenty-one calendar days of the receipt of a written decision or of the failure to issue a decision as stated in the preceding subparagraph, any aggrieved party may file a notice of claim for an adjudicatory hearing with the division of hearing officers or the aggrieved party may file an action directly in a court of competent jurisdiction and shall serve copies thereof upon all other parties in the

form and manner prescribed by the rules governing the conduct of adjudicatory proceedings of the division of hearing officers. In the event an aggrieved party exercises his option to file an action directly in court as provided in the previous sentence, the twenty-one day period shall not apply to such filing and the period of filing such action shall be the same period otherwise applicable for filing a civil action in superior court. The appeal shall be referred to a hearing officer experienced in construction law and shall be prosecuted in accordance with the formal rules of procedure for the conduct of adjudicatory hearings of the division of hearing officers, except as provided below. The hearing officer shall issue a final decision as expeditiously as possible, but in no event more than one hundred and twenty calendar days after conclusion of the adjudicatory hearing, unless the decision is delayed by a request for extension of time for filing post-hearing briefs or other submissions assented to by all parties. Whenever, because an extension of time has been granted, the hearing officer is unable to issue a decision within one hundred and twenty days, he shall notify all parties of the reasons for the delay and the date when the decision will issue. Failure to issue a decision within the one hundred and twenty-day period or within the additional period specified in such written notice shall give the petitioner the right to pursue any legal remedies available to him without further delay.

(d) When the amount in dispute is less than ten thousand dollars, a contractor who is party to the dispute may elect to submit the appeal to a hearing officer experienced in construction law for expedited hearing in accordance with the informal rules of practice and procedure of the division of hearing officers. An expedited hearing under this subparagraph shall be available at the sole option of the contractor. The hearing officer shall issue a decision no later than sixty days following the conclusion of any hearing conducted pursuant to this subparagraph. The hearing officer's decision shall be final and conclusive, and shall not be set aside except in cases of fraud.

(2) The commissioner of administration shall require the division of hearings officers to prepare annually a report concerning the construction contract claims submitted to the division during the preceding twelve months, in such form as the commissioner shall prescribe. The report shall contain, at a minimum, the following information: the number of claims submitted; the names of all parties to each such claim; a brief description of the claim; the date of submission and of disposition of the claim; its disposition, whether by settlement, withdrawal, default or written decision; and the number of claims currently pending. The original of the report shall be submitted to the commissioner of administration by January fifteenth, and a copy shall be filed with the state librarian and shall be a public document."

Section 39R. KEEPING AND MAINTAINING OF BOOKS, RECORDS AND ACCOUNTS; STATEMENT OF MANAGEMENT ON INTERNAL ACCOUNTING CONTROL; FINANCIAL STATEMENTS; ENFORCEMENT.

"(a) The words defined herein shall have the meaning stated below whenever they appear in this section:

(3) "Contractor" means any person, corporation, partnership, joint venture, sole proprietorship, or other entity awarded a contract pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A to forty-four H, inclusive, of chapter one hundred and forty-nine, which is for an amount or estimated amount greater than one hundred thousand dollars.

(4) "Contract" means any contract awarded or executed pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven and any contract awarded or executed pursuant to section

eleven C of chapter twenty-five A, section thirty-nine M of chapter thirty, or sections forty-four A through forty-four H, inclusive, of chapter one hundred and forty-nine, which is for amount or estimated amount greater than one hundred thousand dollars.

(5) "Records" means books of original entry, accounts, checks, bank statements and all other banking documents, correspondence, memoranda, invoices, computer printouts, tapes, discs, papers and other documents or transcribed information of any type, whether expressed in ordinary or machine language.

(6) "Independent Certified Public Accountant" means a person duly registered in good standing and entitled to practice as a certified public accountant under the laws of the place of his residence or principal office and who is in fact independent. In determining whether an accountant is independent with respect to a particular person, appropriate consideration should be given to all relationships between the accountant and that person or any affiliate thereof.

Determination of an accountant's independence shall not be confined to the relationships existing in connection with the filing of reports with the awarding authority.

(7) "Audit," when used in regard to financial statements, means an examination of records by an independent certified public accountant in accordance with generally accepted accounting principles and auditing standards for the purpose of expressing a certified opinion thereon, or, in the alternative, a qualified opinion or a declination to express an opinion for stated reasons.

(8) "Accountant's Report," when used in regard to financial statements, means a document in which an independent certified public accountant indicates the scope of the audit which he has made and sets forth his opinion regarding the financial statements taken as a whole with a listing of noted exceptions and qualifications, or an assertion to the effect that an overall opinion cannot be expressed. When an overall opinion cannot be expressed the reason therefor shall be stated. An accountant's report shall include as a part thereof a signed statement by the responsible corporate officer attesting that management has fully disclosed all material facts to the independent certified public accountant, and that the audited financial statement is a true and complete statement of the financial condition of the contractor.

(9) "Management," when used herein, means the chief executive officers, partners, principals or other person or persons primarily responsible for the financial and operational policies and practices of the contractor.

(10) Accounting terms, unless otherwise defined herein, shall have a meaning in accordance with generally accepted accounting principles and auditing standards.

(b) Subsection (a)(2) hereof notwithstanding, every agreement or contract awarded or executed pursuant to sections thirty-eight A 1/2 to thirty-eight O, inclusive, of chapter seven, or eleven C of chapter twenty-five A, and pursuant to section thirty-nine M of chapter thirty or to section forty-four A through H, inclusive, of chapter one hundred and forty-nine, shall provide that:

(1) The contractor shall make, and keep for at least six years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the contractor, and

(2) until the expiration of six years after final payment, the office of inspector general, and the commissioner of capital asset management and maintenance shall have the right to examine any books, documents, papers or records of the contractor or of his subcontractors that directly pertain to, and involve transactions relating to, the contractor or his subcontractors, and

(3) if the agreement is a contract as defined herein, the contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the awarding authority, including in his description the date of the change and reasons therefor, and shall accompany said description with a letter from the contractor's independent certified public accountant approving or otherwise commenting on the changes, and

(4) if the agreement is a contract as defined herein, the contractor has filed a statement of management on internal accounting controls as set forth in paragraph (c) below prior to the execution of the contract, and

(5) if the agreement is a contract as defined herein, the contractor has filed prior to the execution of the contracts and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in paragraph (d) below.

(c) Every contractor awarded a contract shall file with the awarding authority a statement of management as to whether the system of internal accounting controls of the contractor and subsidiaries reasonably assures that:

(1) transactions are executed in accordance with management's general and specific authorization;

(2) transactions are recorded as necessary:

i. to permit preparation of financial statements in conformity with generally accepted accounting principles, and

ii. to maintain accountability for assets;

(3) access to assets is permitted only in accordance with management's general or specific authorization; and

(4) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.

Every contractor awarded a contract shall also file with the awarding authority a statement prepared and signed by an independent certified public accountant, stating that he has examined the statement of management on internal accounting controls, and expressing an opinion as to:

(5) whether the representations of management in response to this paragraph, and paragraph (b) above are consistent with the result of management's evaluation of the system of internal accounting controls; and

(6) whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.

(d) Every contractor awarded a contract by the commonwealth or by any political subdivision thereof shall annually file with the commissioner of capital asset management and maintenance during the term of the contract a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. The final statement filed shall include the date of final payment. All statements shall be accompanied by an accountant's report. Such statements shall be made available to the awarding authority upon request.

(e) The office of inspector general, the commissioner for capital asset management and maintenance and any other awarding authority shall enforce the provisions of this section. The commissioner of

capital asset management and maintenance may after providing an opportunity for the inspector general and other interested parties to comment, promulgate pursuant to the provisions of chapter thirty A such rules, regulations and guidelines as are necessary to effectuate the purposes of this section. Such rules, regulations and guidelines may be applicable to all awarding authorities. A contractor's failure to satisfy any of the requirements of this section may be grounds for debarment pursuant to section forty-four C of chapter one hundred and forty-nine.

(f) Records and statements required to be made, kept or filed under the provisions of this section shall not be public records as defined in section seven of chapter four and shall not be open to public inspection; provided, however, that such records and statements shall be made available pursuant to the provisions of clause (2) of paragraph (b)."

Section 39S. CONTRACTS FOR CONSTRUCTION; REQUIREMENTS.

(a) "As used in this section the word "person" shall mean any natural person, joint venture, partnership corporation or other business or legal entity. Any person submitting a bid for, or signing a contract to work on, the construction, reconstruction, alteration, remodeling or repair of any public work by the commonwealth, or political subdivision thereof, or by any county, city, town, district, or housing authority, and estimated by the awarding authority to cost more than \$10,000, and any person submitting a bid for, or signing a contract to work on, the construction, reconstruction, installation, demolition, maintenance or repair of any building by a public agency, estimated to cost more than \$10,000, shall certify on the bid, or contract, under penalties of perjury, as follows:

- (1) That he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work;
- (2) that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and
- (3) that all employees to be employed in the work subject to this bid have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration.

(b) Any employee found on a worksite subject to this section without documentation of successful completion of a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration shall be subject to immediate removal.

(c) The attorney general, or his designee, shall have the power to enforce this section including the power to institute and prosecute proceedings in the superior court to restrain the award of contracts and the performance of contracts in all cases where, after investigation of the facts, he has made a finding that the award or performance has resulted in violation, directly or indirectly, of subsection (b), and he shall not be required to pay to the clerk of the court an entry fee in connection with the institution of the proceeding."

Section 40. DISCHARGE OR RELEASE OF BONDS.

"Bonds given to the commonwealth, any county, city, town or political subdivision to secure the performance of contracts for the construction or repair of public buildings or other public works may be

discharged or released by the awarding authority, upon such terms as it deems expedient, after the expiration of one year from the time of completion, subject to section thirty-nine K, of the work contracted to be done; provided that no claim filed under said bond is pending, and provided further, that no such bonds shall be discharged or released prior to the expiration of all special guarantees provided for in the contract unless new bonds in substitution therefor specifically relating to the unexpired guarantees shall be taken."

ATTENTION IS DIRECTED TO THE FOLLOWING SECTIONS OF CHAPTER 82 (THE LAYING OUT, ALTERATION, RELOCATION AND DISCONTINUANCE OF PUBLIC WAYS, AND SPECIFIC REPAIRS THEREON) OF THE GENERAL LAWS OF MASSACHUSETTS AS AMENDED TO DATE.

Section 40. DEFINITIONS APPLICABLE TO SECTIONS 40A TO 40E.

"The following words, as used in this section and sections 40A to 40E, inclusive, shall have the following meanings:

"Company", natural gas pipeline company, petroleum or petroleum products pipeline company, public utility company, cable television company, municipal traffic signal department, and municipal utility company or department that supply gas, electricity, telephone, communication or cable television services or private water companies within the city or town where such excavation is to be made.

"Description of excavation location", such description shall include the name of the city or town, street, way, or route number where appropriate, the name of the streets at the nearest intersection to the excavation, the number of the buildings closest to the excavation or any other description, including landmarks, utility pole numbers or other information which will accurately define the location of the excavation.

"Emergency", a condition in which the safety of the public is in imminent danger, such as a threat to life or health or where immediate correction is required to maintain or restore essential public utility service.

"Excavation", an operation for the purpose of movement or removal of earth, rock or the materials in the ground including, but not limited to, digging, blasting, augering, backfilling, test boring, drilling, pile driving, grading, plowing in, hammering, pulling in, jacking in, trenching, tunneling and demolition of structures.

"Excavator", any entity including, but not limited to, a person, partnership, joint venture, trust, corporation, association, public utility, company or state or local government body which performs excavation operations.

"Marking standards", the methods by which a company designates its facilities in accordance with standards established by the Common Ground Alliance and the American Public Works Association.

"Non-mechanical means", excavation using any device or tool manipulated by human power, including air vacuum, air blowing or similar methods of excavation designed to minimize direct contact with utilities.

"Premark", to delineate the general scope of the excavation or boring on the paved surface of the ground using white paint, or stakes or other suitable white markings on nonpaved surfaces. No premarking shall be acceptable if such marks can reasonably interfere with traffic or pedestrian control or are misleading to the general public. Premarking shall not be required of any continuous

excavation that is over 500 feet in length.

"Professional land surveyor", a professional land surveyor as defined in section 81D of chapter 112.

"Safety zone", a zone designated on the surface by the use of standard color-coded markings which contains the width of the facilities plus not more than 18 inches on each side.

"Standard color-coded markings", red - electric power lines, cables, conduit or light cables; yellow - gas, oil, street petroleum, or other gaseous materials; orange - communications cables or conduit, alarm or signal lines; blue - water, irrigation and slurry lines; green - sewer and drain lines; white - premark of proposed excavation.

"System", the underground plant damage prevention system as defined in section 76D of chapter 164."

Section 40A. EXCAVATIONS; NOTICE.

"No excavator installing a new facility or an addition to an existing facility or the relay or repair of an existing facility shall, except in an emergency, make an excavation, in any public or private way, any company right-of-way or easement or any public or privately owned land or way, unless at least 72 hours, exclusive of Saturdays, Sundays and legal holidays but not more than 30 days before the proposed excavation is to be made, such excavator has premarked not more than 500 feet of the proposed excavation and given an initial notice to the system. Such initial notice shall set forth a description of the excavation location in the manner as herein defined. In addition, such initial notice shall indicate whether any such excavation will involve blasting and, if so, the date and the location at which such blasting is to occur.

Any professional land surveyor working on a preliminary design for a new facility or renovation where excavation is necessary shall: (i) Premark the proposed excavation; and (ii) provide initial notice to the system.

The notice requirements shall be waived in an emergency as defined herein; provided, however, that before such excavation begins or during a life-threatening emergency, notification shall be given to the system and the initial point of boring or excavation shall be premarked. The excavator shall ensure that the underground facilities of the utilities in the area of such excavation shall not be damaged or jeopardized.

In no event shall any excavation by blasting take place unless notice thereof, either in the initial notice or a subsequent notice accurately specifying the date and location of such blasting shall have been given and received at least 72 hours in advance, except in the case of an unanticipated obstruction requiring blasting when such notice shall be not less than four hours prior to such blasting. If any such notice cannot be given as aforesaid because of an emergency requiring blasting, it shall be given as soon as may be practicable but before any explosives are discharged."

Section 40B. DESIGNATION OF LOCATION OF UNDERGROUND FACILITIES.

"Within 72 hours, exclusive of Saturdays, Sundays and legal holidays, from the time the initial notice is received by the system or at such time as the company and the excavator or professional land surveyor agree, such company shall respond to the initial notice or subsequent notice by designating the location of the underground facilities within 15 feet in any direction of the premarking so that the existing facilities are to be found within a safety zone. Such safety zone shall be so designated by the use of standard color-coded markings. The providing of such designation by the company shall

constitute prima facie evidence of an exercise of reasonable precaution by the company as required by this section; provided, however, that in the event that the excavator or professional land surveyor has given notice as aforesaid at a location at which because of the length of excavation the company cannot reasonably designate the entire location of its facilities within such 72 hour period, then such excavator or professional land surveyor shall identify for the company that portion of the excavation which is to be first made and the company shall designate the location of its facilities in such portion within 72 hours and shall designate the location of its facilities in the remaining portion of the location within a reasonable time thereafter. When an emergency notification has been given to the system, the company shall make every attempt to designate its facilities as promptly as possible. A company shall conduct periodic audits to ensure: (i) the accuracy of the designated location and marking of its facilities; and (ii) its adherence to marking standards.”

Section 40C. EXCAVATOR'S RESPONSIBILITY TO MAINTAIN DESIGNATION MARKINGS; DAMAGE CAUSED BY EXCAVATOR.

“After a company has designated the location of its facilities at the location in accordance with section 40B, the excavator shall be responsible for maintaining the designation markings at such locations, unless such excavator requests remarking at the location due to the obliteration, destruction or other removal of such markings. The company shall then remark such location within 24 hours following receipt of such request.

When excavating in close proximity to the underground facilities of any company when such facilities are to be exposed, non-mechanical means shall be employed, as necessary, to avoid damage in locating such facility and any further excavation shall be performed employing reasonable precautions to avoid damage to any underground facilities including, but not limited to, any substantial weakening of structural or lateral support of such facilities, penetration or destruction of any pipe, main, wire or conduit or the protective coating thereof, or damage to any pipe, main, wire or conduit.

If any damage to such pipe, main, wire or conduit or its protective coating occurs, the company shall be notified immediately by the excavator responsible for causing such damage.

The making of an excavation without providing the notice required by section 40A with respect to any proposed excavation which results in any damage to a pipe, main, wire or conduit, or its protective coating, shall be prima facie evidence in any legal or administrative proceeding that such damage was caused by the negligence of such person.”

Section 40D. LOCAL LAWS REQUIRING EXCAVATION PERMITS; PUBLIC WAYS.

“Nothing in this section shall affect or impair local ordinances or by-laws requiring a permit to be obtained before excavation in a public way or on private property; but notwithstanding any general or special law, ordinance or by- law to the contrary, to the extent that any permit issued under the provisions of the state building code or state fire code requires excavation by an excavator on a public way or on private property, the permit shall not be valid unless the excavator notifies the system as required pursuant to sections 40 and 40A, before the commencement of the excavation, and has complied with the permitting requirements of chapter 82A.”

Section 40E. VIOLATIONS OF SECS. 40A TO 40E; PUNISHMENT.

“Any person or company found by the department of public utilities, after a hearing, to have violated any provision of sections 40A to 40E, inclusive, shall be fined \$1000 for the first offense and not less than \$5,000 nor more than

\$10,000 for any subsequent offense within 12 consecutive months as set forth by the rules of said department; provided, however, that nothing herein shall be construed to require forfeiture of any penal sum by a state or local government body for violation of section 40A or 40C; and provided, further, that nothing herein shall be construed to require the forfeiture of any penal sum by a residential property owner for the failure to premark for an excavation on such person's residential property. The department of public utilities may require any person or company not in compliance with sections 40A to 40E, inclusive, to complete a "Dig Safe" training program in lieu of a fine for a first offense. "

ATTENTION IS DIRECTED TO THE FOLLOWING SECTIONS OF CHAPTER 30 (AN ACT MOBILIZING ECONOMIC RECOVERY IN THE COMMONWEALTH) OF THE ACTS OF 2009.

Section 33.

- (a) "Notwithstanding any general or special law to the contrary, the following requirements shall apply to any public works project funded by the American Recovery and Reinvestment Act of 2009 where the amount of construction costs under any contract awarded is likely to exceed \$1,000,000. For the purposes of this section, "public works" shall mean building or work the construction of which is carried on by authority of the commonwealth, or by a county, town, authority or district, or with funds of a federal agency or the commonwealth or a county, city, town, authority or district to serve the interest of the general public, regardless of whether title thereof is in the commonwealth or in a county, city, town, authority or district; provided, however, that for the purposes of this definition, "construction" shall have the meaning provided in section 27D of chapter 149 of the General Laws.
- (b) For any public works project subject to subsection (a), the specifications set forth in any request for responses shall include a requirement that, on a per project basis, not less than 20 per cent of the total hours of employees receiving an hourly wage who are directly employed on the site of the project, employed by the contractor or a subcontractor and subject to the prevailing wage, shall be performed by apprentices in bona fide apprentice training programs as provided in sections 11H and 11I of chapter 23 of the General Laws which are approved by the division of apprentice training in the executive office of labor and workforce development.
- (c) During the performance of a public works project subject to subsections (a) and (b), the contractor shall submit periodic reports to the awarding authority with records indicating the total hours worked by all journeymen and apprentices in positions subject to the apprentice requirement. In any instance in which the apprentice hours do not constitute 5 per cent of the total hours of employees subject to the apprentice requirement, the contractor shall submit a plan to the awarding authority describing how the contractor shall comply with the apprentice requirement.
- (d) The attorney general shall have all the necessary powers to require compliance with the requirements of subsections (a), (b) and (c) therewith, including the power to institute and prosecute proceedings in the superior court to restrain the award of contracts and the performance of contracts. Prior to award of the contract, an awarding authority may petition the attorney general for approval to adjust the requirements set forth in said subsections (a), (b) and (c). The attorney general may adjust these requirements only if he determines that compliance with these requirements is not feasible or if application of the requirements would be preempted by federal law.
- (e) An awarding authority serving a low-income population may require additional specifications that address the needs of its clients including, but not limited to, preferential hiring for residents of public housing authorities for available apprenticeship positions.

(f) Subject to appropriation, the division of apprentice training shall enhance its outreach efforts to underserved populations in order to increase and diversify the number of apprentices in the commonwealth."

Section 39.

"Any entity located in the commonwealth that receives federal funds through the American Recovery and Reinvestment Act of 2009 shall provide information as directed by the secretary of administration and finance regarding the use of the funds. The required information shall include, but not be limited to, the reporting information required by the federal government and any other information deemed necessary by the secretary to administer the American Recovery and Reinvestment Act of 2009 responsibly, efficiently and transparently. To the extent possible, the secretary shall work to streamline the reporting of this information, minimize duplication of data entry by recipients and ensure data consistency. The secretary may issue regulations to effectuate this reporting requirement."

Section 40.

"Employers and hiring agents on all projects funded in whole or in part by the American Recovery and Reinvestment Act of 2009 shall post notices of available employment opportunities to the commonwealth's job bank or the one-stop career centers closest to where the projects shall be located. The postings shall contain such information as directed by the secretary of labor and workforce development. The secretary may issue regulations to effectuate this job posting requirement."

END OF SECTION

SECTION 00830
ATTACHMENT C -1
**MINORITY AND WOMEN BUSINESS ENTERPRISES
GOALS FOR CONSTRUCTION PROJECTS**

Minority-owned Business Enterprise (MBE), Women-owned Business Enterprise (WBE) and Equal Employment Opportunity polices of the Massachusetts Water Resources Authority (MWRA) are applicable to this Contract. The Contractor shall comply with all applicable laws and regulations pertaining to nondiscrimination, equal opportunity and affirmative action, including without limitation executive orders and rules and regulations of federal and state agencies of competent jurisdiction. The Contractor shall make positive efforts to achieve: (1) a minority employee work force goal of 15.3 percent, (2) a woman employee work force goal of 6.90 percent, (3) a goal of 7.24 percent participation of Minority-owned Business Enterprise(s), and a goal of 3.60 percent participation of Woman-owned Business Enterprise(s) within project contracts. At a minimum, the Contractor should allow MBEs and WBEs the maximum feasible opportunity to compete for subagreements to be performed under the project.

END OF SECTION

SECTION 00830
ATTACHMENT C-2
TOWN OF ARLINGTON Bylaws
TITLE I; ARTICLE 16
CONSTRUCTION PROJECTS

Section 1. Women Work Force Participation

Any Town board or official in charge of a construction or reconstruction project is required to include in the contract documents the following:

B. Contractor shall maintain as a goal on this project a not less than five percent ratio of women work force to total project hours in both the general contract and each individual filed sub-bid contract, if applicable. The preceding sentence shall be included in all construction contracts whether entered into by the Town pursuant to the provisions of M.G.L. c. 149 or M.G. L. c 30, §39M et. seq. provided however, that if entered into under Chapter 30 same shall not be deemed to apply where the projected bid price as determined by the Director of Public Works is not likely to exceed \$200,000.

C. A Labor Scheduling Table which will be used as a tool for achieving a range of women work force participation for the entire project in both the general contract and each individual filed sub-bid contract.

Section 2. Equal Opportunity Goal Compliance

Any Town board or official in charge of a construction or reconstruction project is required to include in the contract documents the following:

Before starting work, the contractors (includes the general contractor, for itself and its subcontractors, as well as all filed sub-bid contractors, if applicable) will submit plans for achievement of the equal opportunity goals of the contract. All contractors will be required to make a good faith effort to achieve these goals. The plan will indicate if the contractors expect to achieve the requirements during the first quarter. If there are reasons why the contractors do not expect to achieve the requirements during the first quarter year of the contract construction phase, then the contractors shall provide a plan calculated to address, to the extent reasonably possibly, these obstacles to a good faith effort to achieve such goals.

Not more than ten days following the end of each work quarter, the contractors will report on the achievement of the goals, detailing the good faith efforts that have been made and will continue to be made and any other appropriate efforts not yet undertaken.

All reports will be signed by an officer or principal of the company who has the authority to contractually obligate the company.

Section 3. Recruitment and Training

Any board, officer, committee, or other agency of the Town, which acts on behalf of the Town in making or supervising any contract, in an amount exceeding the sum of \$100,000 for the purchase of goods or services or for the construction, renovation, or

repair of buildings or other improvement of real estate, may make arrangements with contractors and other interested agencies for special programs of recruitment and training in connection with the work to be performed on such contract, with the objective of promoting equal employment opportunity for members of minority groups protected by the fair employment laws of the Commonwealth and the United States. Any board, officer, committee or other Town agency may expend Town funds in carrying them out provided that appropriations specifically designed for such purposes have been voted by the Town Meeting.

MINORITY BUSINESS PARTICIPATION**LETTER OF INTENT**

The undersigned intends to perform work in connection with the above project as (check one) *:

- an individual a
- partnership a
- corporation a
- joint venture

The minority status of the undersigned is (a) certified by the State Office of Minority Women Business Assistance [SOMWBA] or (b) has applied for certification on the attached Minority Business Certification Application.

The undersigned is prepared to perform the following described work in connection with the above project. (Specify in detail particular work items or parts thereof to be performed.) *

at the following price*: _____

You have projected the following commencement date for such work, and the undersigned is projecting completion of such work as follows:

<u>Items</u>	<u>Projected Commencement</u>	<u>Projected Date</u>	<u>Completion Date</u>
--------------	-------------------------------	-----------------------	------------------------

The above work will not be subcontracted to a non-minority business. The undersigned will enter into a formal agreement with you for the above work conditions upon your execution of a contract for the above project.

Date: _____

Name of Minority Business _____

**SCHEDULE FOR PARTICIPATION BY
MINORITY BUSINESS ENTERPRISES**

Name of Minority <u>Business Enterprise</u>	Total <u>Price</u>
--	-----------------------

Total Bid Amount _____

Total amount to be paid to Minority Business Enterprises _____

PERCENT OF TOTAL BID PRICE WHICH IS TO BE PAID TO MINORITY BUSINESS
ENTERPRISES FOR WORK PERFORMED UNDER THIS CONTRACT

WOMEN BUSINESS PARTICIPATION**LETTER OF INTENT**

The undersigned intends to perform work in connection with the above project as (check one):

- an individual a
- partnership a
- corporation a
- joint venture

The minority status of the undersigned is (a) certified by the State Office of Minority Women Business Assistance [SOMWBA] or (b) has applied for certification on the attached Minority Business Certification Application.

The undersigned is prepared to perform the following described work in connection with the above project. (Specify in detail particular work items or parts thereof to be performed.)

at the following price:: _____

You have projected the following commencement date for such work, and the undersigned is projecting completion of such work as follows:

<u>Items</u>	<u>Projected Commencement</u>	<u>Projected Date</u>
	<u>Completion Date</u>	

The above work will not be subcontracted to a non-minority business. The undersigned will enter into a formal agreement with you for the above work conditions upon your execution of a contract for the above project.

Date: _____

Name of Minority Business

**SCHEDULE FOR PARTICIPATION BY
WOMEN BUSINESS ENTERPRISE**

Name of Minority <u>Business Enterprise</u>	Total <u>Price</u>
--	-----------------------

Total Bid Amount _____

Total amount to be paid to Women Business Enterprises _____

PERCENT OF TOTAL BID PRICE WHICH IS TO BE PAID TO WOMEN BUSINESS
ENTERPRISES FOR WORK PERFORMED UNDER THIS CONTRACT

SECTION 00830
ATTACHMENT D
CHANGE ORDERS

Policy:

This section supplements Article 11, Changes to the Contract, in the General Conditions and Supplementary Conditions.

All executed change orders submitted to the Engineer for review and processing must be prepared in accordance with the attached change order format (Appendix A) with the appropriate number of copies, calculation sheet(s) (Appendix B) and all other supporting documentation necessary for evaluation. Failure to comply with these instructions will result in delays in processing the change order.

In order to avoid possible delays with approval of change orders, at the beginning of the project and as circumstances warrant, the Contractor shall submit a list of construction equipment, identifying major pieces of equipment to be utilized on the project. The list shall include the Contractor's designation, if any, the manufacturer, model, year of manufacture, serial number, size and horsepower of equipment. The Contractor shall also provide for approval a proposed bluebook equipment rental rate development that separately lists for each piece of equipment the monthly rental rate, area adjustment factor, depreciation factor, estimated operating cost per hour and total hourly rate. In the event the Contractor fails or is unable to provide appropriate rate information the Engineer may develop equipment rental rates for use on change orders.

Payment of Change Orders:

Payment of all change orders shall be in accordance with the relevant provisions of Massachusetts General Laws, Chapter 30, Section 39G for non-building construction and Section 39K for building construction as amended from time to time.

Payment of change orders shall be made in accordance with one of the following three methods:

- M. Existing unit prices as set forth in the contract; or
- N. Agreed upon lump sum or unit prices; or
- O. Time and materials

A. Payment for work for which there is a unit price in the contract:

Where the contract contains a unit price for work and the Engineer orders a change for work of the same kind as other work contained in the contract and is performed under similar physical conditions, the Contractor shall accept full and final payment at the contract unit price(s) for the acceptable quantities. Under certain circumstances, the unit

prices may be subject to revaluation and adjustment. See Article 13 in the Supplementary Conditions.

B. Payment for work or materials for which no price is contained in the contract:

If the Engineer directs, the Contractor shall submit promptly in writing to the Engineer an offer to do the required work on a lump sum or unit price basis, as specified by the Engineer. The stated price, either lump sum or unit price, shall be divided so as to show that it is the sum of:

1. The estimated cost of Labor, plus
2. Direct Labor Cost, plus
3. Material and Freight Costs, plus
4. Equipment Costs, plus
5. An amount not to exceed 15% of the sum of items 1 through 4 for overhead and profit, plus (if applicable),
6. In the case of work done by a subcontractor an amount not to exceed 5%, for the general contractor of the sum of the cost (not including subcontractor's overhead and profit) of items 1 through 4 for his overhead and profit (less, if applicable),
7. Credits for work deleted from the contract, including actual costs of the deleted work plus the percentage of overhead, profit, bonds and insurance attributable to such credit amount.

C. Payment for work on a time and materials basis:

Unless an agreed lump sum and/or unit price is obtained as noted above and is so stated in the change price, the Contractor shall accept as full payment for which no agreement is contained in contract, an amount equal to:

1. The estimated cost of Labor, plus
2. The Direct Labor Costs, plus
3. Equipment Costs, plus
4. Material and Freight Costs, plus
5. An amount not to exceed 15% of the sum of items 1 through 4 for overhead and profit, plus, if applicable,
6. In the case of work done by a subcontractor an amount not to exceed 5%, for the general contractor of the sum of the cost (not including subcontractor's overhead and profit) of items 1 through 4 for his overhead and profit (less, if applicable),
7. Credit for work deleted from the Contract, including actual costs of the deleted work plus the percentage of overhead, profit, bonds and insurance attributable to such credit amount.

Explanation of items 1 through 7 as outlined in "B" and "C" above:

1. Labor - Only those workers employed on the project who are doing the extra work, including the foreman in charge, are allowable. General foremen, superintendents, or other supervisory personnel are considered to be included in the overhead markup as provided in items 5 and/or 6. Hourly labor rates in excess of those as listed in the contract wage rates require documentation. As a minimum, an explanation and the appropriate copy of the certified payroll are required.
2. Direct Labor Costs - These costs are limited to those which are required in the contract document. Coverage in excess of the contract provisions, secured by the contractor/subcontractor(s) at his option, are ineligible. The following list of typical direct labor charges is provided for your assistance and is in no way intended to be complete or all encompassing:

Workman's Compensation

Federal/State: Social Security Tax and Unemployment Tax;

Health, Welfare and Pension Benefits; (this cost is included in the wage rates appearing in the Attachment A Massachusetts Wage Rates.

Liability insurance:	Bodily injury; excess umbrella; property damage; public liability
Blasters insurance:	If applied to any required direct labor costs
Builders risk insurance:	If applied to any required direct labor costs
Experience modification insurance:	If applied to any required direct labor costs
Surcharges:	If applied to any required direct labor costs

Following award and prior to execution of a construction contract, the Contractor and filed subbidders (where applicable) shall submit for review by the Owner, documentation to establish the markup percentage(s).

The documented direct labor markup for this contract may be adjusted on an annual basis as measured from the date the contract is executed. The contract agreement will provide for the establishment of the Direct Labor Cost percentage.

3. Material and Freight - Only those materials required as a result of the change order and reasonable freight charges for delivery of same are allowable.
4. Equipment - Only the equipment required as a result of the change order is allowable. Equipment rental rates shall be governed by the current Equipment Watch, division of

Intertec Publishing [Formerly Nielson/Dataquest] Rental Rate Bluebook for Construction Equipment (the "Bluebook"). In determining the rental rate, the following shall apply:

- a. For equipment already on the project - the monthly prorated rental rate by the hourly use shall be applicable;
- b. For equipment not on the project the daily rate, the weekly rate, or monthly rate will prevail, whichever will prove to be most cost effective. Small tools and manual equipment are examples of costs not allowable under this item. These costs are considered to be included in the overhead markup as provided in items 5 and/or 6.

(1 Month (Normal Use) = 176 hours)

5.& 6. Overhead and Profit - All other costs not previously mentioned are considered to be included in this item, be it for the general contractor or subcontractor(s).

7. Credits - Work deleted, material and equipment removed from the contract, stored and/or returned shall be credited to the cost of the change order, less documented costs.

This change order will be prepared in such manner as to clearly separate Eligible and Ineligible Costs (as applicable to state-funded projects).

The Contractor shall furnish itemized statements of the cost of the work ordered and shall give the Engineer access to all accounts, bills and vouchers relating thereto; and unless the Contractor shall furnish such itemized statements, and access to all accounts, bills and vouchers, he shall not be entitled to payment for any items of extra work for which such information is sought by the Engineer.

APPENDIX A
Change Order
(Enter Project Name)
(Enter Location)

Sheet ___ of ___

Date _____

Project No. _____ SRF No. (if applicable) _____

Contract No. _____

Change Order No. _____

Contract Amount (As Bid) \$ _____

Amount of Previous Change Orders \$ _____

Net Change in Contract Price (this Change Order) \$ _____

Total Adjusted Contract Price (including this Change Order\$ _____

This Change Order extends the time to complete the work by _____ calendar days.

The extended completion date is _____
_____.

This Change Order checked by: _____
Resident Representative _____ Date _____

This Change Order is requested by: _____

This Change Order is recommended by:

Consultant Engineer _____ P.E. # _____ Date _____

The undersigned agree to the terms of the Change Order.

Contractor _____ Date _____

Owner _____ Date _____

Certification of Appropriation under M.G.L. c.44, s.31C: Adequate funding in an amount sufficient to cover the total cost of this change order is available.

By: _____
Certification Officer (Auditor, Accountant, Treasurer) _____ Date _____

Do not write below this space: this space reserved for STATE AGENCY APPROVAL

CHANGE ORDER (continued)
(Enter Project Name)
(Enter Location)

Sheet ____ of ____

Date _____

Project No. _____ SRF No. (if applicable) _____

Contract No. _____

Change Order No. _____

Owner's Name: _____

Owner's Address: _____

Contractor's Name: _____

Contractor's Address: _____

Item 1:

Description of Change: _____

Reason for Change: _____

Backup Information: _____

Cost: \$ _____

Item 2

Description of Change: _____

Reason for Change: _____

Backup Information: _____

Cost: \$ _____

Appendix B
Example Calculation
Sheet

C. Labor

Foreman hours (@)	10 hours @ \$10.00/hour \$100.00	10
	Engineer 8.80/hour 85.00	
Operator	10 hours @ 9.50/hour	95.00
Laborers	24 hours @ 7.00/hour	<u>168.00</u>
		\$448.00

D. Direct Labor Cost (use the agreed upon Direct Labor Cost)

*(30)% of \$448.

*(used for example purposes only) \$ 134.00

E. Materials & Freight

150 l.f. of 12" pipe @ \$2.00/l.f.	\$ 300.00
15 v.f. precast SMH	1,700.00
Freight (slip#____ enclosed)	<u>25.00</u>



F.

1 Backhoe 800.00	10 hours @ \$ 80.00/hour	\$
1 Truck-crane	10 hours @ 100.00/hour	<u>1000.00</u>
		\$1800.00

TOTAL (items 1 through 4): \$4,407.00

G. (20%) markup for Overhead, Profit

(20%) of \$4,407 \$ 881.00

H. (7½ %) markup on subcontractor's cost for general contractor (if subcontractor is involved) (7½ %) of \$4,407 \$ 331.00

I. Credits (deductibles) -\$323.00

TOTAL COST: \$5,296.00

Reminder: Provide support documentation as necessary i.e. vouchers, correspondence, calculation, photographs, reports.

END OF SECTION

SECTION 00890

PERMITS

PART 1 – GENERAL

1. DESCRIPTION:

This Section provides specific information and defines specific requirements of the Contractor regarding the preparation and acquisition of permits required to perform the work of this project.

2. RELATED WORK:

- Section 01110, CONTROL OF WORK AND MATERIALS
- Section 01550, SIGNAGE (TRAFFIC CONTROL)
- Section 01570, ENVIRONMENTAL PROTECTION

3. GENERAL REQUIREMENTS:

- The Owner has obtained or will obtain and pay for the permits listed below, which are required for this project. The Contractor shall assist in obtaining certain permits, as indicated. The Contractor shall obtain and pay for all other permits required, as defined under the Permits subsection of Section 00700, GENERAL CONDITIONS.

<u>Permits by Owner</u>	<u>Status</u>
Street Occupancy Permit	*
8M Sewer Permit to MWRA Wastewater Permitting Unit	**
<p>*Contractor shall prepare permit application after contract is awarded. Permit is available on the Town's website. Owner will pay for and/or waive the permit application fee, if applicable.</p> <p>**Contractor shall prepare permit application after contract is awarded. Owner will submit permit application to MWRA for approval.</p>	

PART 2 - PRODUCTS

Not Used.

PART 3 – EXECUTION

1. PERFORM WORK IN ACCORDANCE WITH REQUIREMENTS:

- The Contractor shall perform the work in accordance with the Contract Documents, including the attached permits/order of conditions, and any applicable municipal requirements.
- The Contractor shall submit the completed “One-Time-Only Discharge Request to Discharge from CIPP Lining Process”, “CIPP Questionnaire – Sewer Rehabilitation Project Non-Discharged Waste(s)” and “Request to Conduct a Root Control Project” permits to the Engineer for approval and submission to the Massachusetts Water Resources Authority (MWRA). Related permit applications are attached.
- Prior to commencing any construction activities, the Contractor shall demonstrate to the Owner and the Engineer, through on-site inspection and submitting copies of permits or approvals, that it is in full compliance with the terms and conditions of all permits specified herein. The Contractor shall maintain full compliance with all permits throughout the performance of the work, and upon request, grant access to permitting authorities to inspect the site for the purpose of verifying such compliance.

END OF SECTION

SECTION 01014
SCOPE AND SEQUENCE OF WORK

PART 1- GENERAL

4. WORK INCLUDED:

- This Section of the specifications covering the scope and sequence of work for the Mystic Street Bridge Reconstruction Project in Arlington, Massachusetts, including:

The scope of work includes the complete replacement of the existing granite masonry and reinforced concrete culvert. The work shall include the demolition of the existing masonry and reinforced concrete, the construction of the proposed multiple steel beam with reinforced concrete deck single span bridge supported on drilled micropile supported integral abutments, the control of water during demolition and construction, bridge excavation, filter fabric, crushed stone, gravel borrow for backfilling, placed riprap, steel bridge railing, approach slabs, paving over the proposed bridge and the approaches and other incidental and related tasks required for the complete reconstruction of the Mystic Street Bridge over Mill Brook in the Town of Arlington, Massachusetts. The Plan Set consists of 25 sheets including Sheets 1 thru 18 which were reviewed and approved by MassDOT on August 1, 2022 and the remaining Sheets 19 thru 25.

- The Contractor shall furnish all labor, materials, equipment, and incidentals required to complete the work as shown on the drawings and as specified herein.
- Work for Mystic Street Bridge Reconstruction Project includes:

- DEMOLITION OF BRIDGE (refer to Section 112,120, and 140 of the Standard Specifications, amended and supplemented as follows:;
- BRIDGE EXCAVATION
- DRILLED MICROPILES
- MICROPILE VERIFICATIONLOAD TEST
- MICROPILE PROOF LOAD TEST
- TEMPORARY SUPPORT OF EXCAVATION
- PLACED RIP RAP
- CONTROL OF WATER
- TEMPORARY SUPPORT FOR UTILITIES
- BRIDGE STRUCTURE, BRIDGE NO. A-10-015

5. RELATED WORK:

- SECTION 01110 - CONTROL OF WORK AND MATERIALS

PART 2 – PRODUCTS

Not applicable.

PART 3 - EXECUTION

2. SEQUENCE OF WORK:

- The Contractor shall be responsible for scheduling its activities and the activities of any subcontractors involved, to meet the completion date, or milestones, established for the contract. Scheduling of all work shall be coordinated with the Owner and Engineer.
- Excavation work: Test Pits must be completed prior to demolition and construction to design temporary utility support plans. Test pits shall be completed before ordering and installing all precast structures.
- Contractor shall coordinate with the Owner, Engineer, and Police Department prior to beginning work.
- All work may be scheduled at the Contractor's discretion within the time of contract so long as it adheres to this scope and sequence of work and all plans and specifications. The schedule is also subject to approval by the Engineer.

END OF SECTION

SECTION 01110
CONTROL OF WORK AND MATERIALS

PART 1 – GENERAL

Not applicable.

PART 2 – PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.01 HAULING, HANDLING AND STORAGE OF MATERIALS:

- The Contractor shall, at its own expense, handle and haul all materials furnished by it and shall remove any of its surplus materials at the completion of the work.
- The Contractor shall provide suitable and adequate storage for equipment and materials furnished by it that are liable to injury and shall be responsible for any loss of or damage to any equipment or materials by theft, breakage, or otherwise.
- All excavated materials and equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly stored in such location as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.
- The Contractor shall be responsible for all damages to the work under construction during its progress and until final completion and acceptance even though partial payments have been made under the Contract.

3.02 EASEMENTS:

- A. As indicated on the drawings, the work is located in easements obtained by the Owner. The Contractor has no rights outside of the easements unless they are obtained from the property owner.
- B. Contractor shall schedule work so that it will cause minimum inconvenience and nuisance to abutting property owners, over the shortest possible time.
- C. Easements shall be kept clean; no rubbish or discarded construction materials shall be allowed to accumulate. Storage of excess construction materials, including soil, ledge, equipment, or machinery on easements will not be allowed.
- D. Restoration of fences, shrubs, trees and grass shall be completed promptly following completion of the work in an easement, to minimize disruption and inconvenience to property owners.
- E. Unless approved by the Engineer, the use of easements for ease of access to and egress from other areas of the project will not be permitted.

3.03 MAINTENANCE OF TRAFFIC:

- A. Unless permission to close the street is received in writing from the proper authority, all excavated materials and equipment shall be placed so that vehicular and pedestrian traffic may be safely maintained at all times.
- B. Should the Chief of Police deem it necessary, uniformed officers will be assigned to direct traffic. The Contractor shall make all arrangements in obtaining uniformed officers required.
- C. The Contractor shall at its own expense, as directed by the Police Traffic Control/Safety Officer, provide and erect acceptable barricades, barrier fences, traffic signs, and all other traffic devices not specifically covered in a bid item, to protect the work from traffic, pedestrians, and animals. The Contractor shall provide sufficient temporary lighting such as lanterns/flashers (electric battery operated) or other approved illuminated traffic signs and devices to afford adequate protection to the traveling public, at no additional cost to the Owner. See Section 01552, CONSTRUCTION ZONE SAFETY PLAN.
- D. The Contractor shall furnish all construction signs that are deemed necessary by and in accordance with Part VI of the Manual on Uniform Traffic Control Devices as published by the U.S. Department of Transportation. In addition, the Contractor may be required to furnish up to 128 square feet of additional special construction warning signs. Size and exact wording of signs shall be determined by the Engineer during construction.
- E. The intent of policing is to ensure public safety by direction of traffic. Police officers are not to serve as watchmen to protect the Contractor's equipment and materials.
- F. Nothing contained herein shall be construed as relieving the Contractor of any of its responsibilities for protection of persons and property under the terms of the Contract.

3.04 CARE AND PROTECTION OF PROPERTY:

The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be promptly restored by the Contractor, at its expense, to a condition similar or equal to that existing before the damage was done, to the satisfaction of the Engineer.

3.05 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES:

- A. All existing buildings, utilities, pipes, poles, wires, fences, curbings, property line markers and other structures which the Engineer decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the contractor. Should such property be damaged, it shall be restored by the Contractor, at no additional cost to the Owner.
- B. The Contractor shall determine the location of all underground structures and utilities (including existing water services, drain lines, electrical lines, and sewers). Services to buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by Contractor.

- C. When fences interfere with the Contractor's operations, it shall remove and (unless otherwise specified) promptly restore them in accordance with Section 01564, EXISTING FENCES.
- D. On paved surfaces the Contractor shall not use or operate tractors, bulldozers, or other power-operated equipment with treads or wheels which are shaped so as to cut or otherwise damage such surfaces.
- E. All property damaged by the Contractor's operations shall be restored to a condition at least equal to that in which it was found immediately before work was begun. Suitable materials and methods shall be used for such restoration.
- F. Restoration of existing property and structures shall be carried out as promptly as practicable and shall not be left until the end of the construction period.

3.06 MAINTENANCE OF FLOW:

- A. The Contractor shall at its own cost, provide for the flow of sewers and drains interrupted during the progress of the work, and shall immediately cart away and dispose of all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the Engineer well in advance of the interruption of any flow.
- B. All existing drainage facilities including, but not limited to; brooks, streams, canals, channels, ditches, culverts, catch basins and drainage piping shall be adequately safeguarded so as not to impede drainage or to cause siltation of downstream areas in any manner whatsoever. If the Contractor damages or impairs any of the aforesaid drainage facilities, it shall repair the same within the same day.
- C. At the conclusion of the work, the Contractor shall remove all silt in drainage structures caused by its operations as described in Section 01740, CLEANING UP.

3.07 REJECTED MATERIALS AND DEFECTIVE WORK:

- A. Materials furnished by the Contractor and condemned by the Engineer as unsuitable or not in conformity with the specifications shall forthwith be removed from the work by the Contractor, and shall not be made use of elsewhere in the work.
- B. Any errors, defects or omissions in the execution of the work or in the materials furnished by the Contractor, even though they may have been passed or overlooked or have appeared after the completion of the work, discovered at any time before the final payment is made hereunder, shall be forthwith rectified and made good by and at the expense of the Contractor and in a manner satisfactory to the Engineer.
- C. The Contractor shall reimburse the Owner for any expense, losses or damages incurred in consequence of any defect, error, omission or act of the Contractor or its employees, as determined by the Engineer, occurring previous to the final payment.

3.08 SANITARY REGULATIONS:

Sanitary conveniences for the use of all persons employed on the work, properly screened from public observation, shall be provided in sufficient numbers in such manner and at such locations as may be approved. The contents shall be removed and disposed of in a satisfactory manner as the occasion requires. The Contractor shall rigorously prohibit the

committing of nuisances within, on or about the work. Any employees found violating these provisions shall be discharged and not again employed on the work without the written consent of the Engineer. The sanitary conveniences specified above shall be the obligation and responsibility of the Contractor.

3.09 SAFETY AND HEALTH REGULATIONS:

This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations (454 CMR 10.0 et. seq.)." The Contractor shall be familiar with the requirements of these regulations.

3.10 SITE INVESTIGATION:

The Contractor acknowledges that it has satisfied itself as to the conditions existing at the site of the work, the type of equipment required to perform this work, the quality and quantity of the materials furnished insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the drawings and specifications made a part of this contract. Any failure of the Contractor to acquaint itself with available information will not relieve it from the responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any conclusion or interpretation made by the Contractor on the basis of the information made available by the Owner.

3.11 ELECTRIC SERVICE:

- A. The Contractor shall make all necessary applications and arrangements and pay for all fees and charges for electrical energy for power and light necessary for the proper completion of this contract during its entire progress. The Contractor shall provide and pay for all temporary wiring, switches, connections, and meters.
- B. There shall be sufficient electric lighting so that all work may be done in a workmanlike manner where there is not sufficient daylight.

3.12 HAZARDOUS WASTE:

Should the Contractor, while performing work under this contract, uncover hazardous materials, as defined in Massachusetts Hazardous Waste Regulations 310 CMR 30.00, he shall immediately notify the Engineer. The Contractor is not, and has no authority to act as, a handler, generator, operator or disposer of hazardous or toxic substances found or identified at the site, and the Owner shall undertake all such functions.

END OF SECTION

SECTION 01250
PRICE ADJUSTMENTS

PART 1 - GENERAL

1.01 WORK INCLUDED:

- A. Price adjustments, as required by MGL Chapter 30, Section 38A, shall be implemented for this Project. Price adjustments, as enumerated in Part 3 of this specification, shall be made for the following items:
 - Liquid Asphalt
 - Diesel fuel and gasoline
 - Structural Steel and Reinforcing Steel
 - Portland Cement Concrete Mixes
- B. Price adjustments shall be made in accordance with the methodology adopted by the Massachusetts Department of Transportation in the following SPECIAL PROVISIONS documents, which are attached, but modified as contained herein:
 1. Document 00811 Monthly Price Adjustment for Hot Mix Asphalt Mixtures, revised July 8, 2016
 2. Document 00812 Monthly Price Adjustment for Diesel fuel and Gasoline, revised January 26, 2009
 3. Document 00813 Price Adjustments for Structural Steel and Reinforcing Steel, dated October 11, 2018
 4. Document 00814 Price Adjustments for Portland Cement concrete Mixes, dated January 12, 2009
- C. Base and Period Prices used to calculate price adjustments shall be as published by the Massachusetts Department of Transportation as presented in Documents 00811 through 00814.
- D. No price adjustments will be allowed beyond the completion date of the contract, unless there is an approved extension of time.

1.02 CONTRACTOR CREDIT TO OWNER SHOULD PRICES DECREASE:

- A. Price adjustments will only be made if the variance between the base price and the period price is Five Percent (5%) or more.
- B. In the instance where the period price is below the base price by 5% or more, then the Contractor shall credit the Owner the adjustment.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.01 LIQUID ASPHALT:

- A. The “Period Price Method” shall be used to determine price adjustments. For projects utilizing reclaimed asphalt include Reclaimed Asphalt Pavement (RAP) Factor (0.0 to <1.0) in calculation of the total price adjustment. Otherwise, use RAP Factor = 1.0.
- B. For bid items involving asphalt paving that are measured and paid on a linear foot basis, or some other basis besides tonnage, the number of tons shall be determined by the Engineer using compacted measure of thickness within the established payment limits.
- C. Asphalt paving not separately measured for payment but rather included as an incidental component of work under a related bid item shall not be considered for price adjustment.

3.02 DIESEL FUEL AND GASOLINE:

- A. Price adjustments shall be determined based on documented quantities of diesel fuel and gasoline usage for site dedicated equipment. This methodology shall replace the price adjustment basis on fuel usage factors, as described within the Massachusetts Department of Transportation Document 00812.
- B. All site dedicated equipment shall be approved by the Engineer for the calculation of any qualifying price adjustment. Prior to the start of work the Contractor shall submit to the Engineer a list of all dedicated equipment for the project. The Contractor shall forward updated submittals, as necessary, throughout the duration of the contract. Only that equipment included within the current approved list shall be considered eligible for calculating a price adjustment under this Section 01250.
- C. The Contractor shall submit fuel delivery slips to the Engineer as a basis for calculating total diesel fuel and gasoline usage for site dedicated equipment. At a minimum, the delivery slips will include the name of the fuel delivery company, the date and location of fueling, the type of fuel, description of the fueled equipment and the quantity for each type of fuel delivered in gallons. Any slips not providing the minimum information shall not be included in the calculation of total diesel fuel and gasoline usage for price adjustment purposes.

3.03 STRUCTURAL AND REINFORCING STEEL:

- A. Period prices for steel are subject to change up to four (4) months after the date of original publication. Therefore, no price adjustment will be made until the index for the period is finalized.

3.04 PORTLAND CEMENT AND CONCRETE:

- A. The price adjustment applies to all projects contained herein in Section 1.01A.
- B. Field Concrete used in water and sewer projects, typically used for thrust blocks and concrete encasement, shall not be considered for price adjustment. Cast-in-place concrete used on these projects will be included in the price adjustment determination.

END OF SECTION

DOCUMENT 01250
SPECIAL PROVISIONS

MONTHLY PRICE ADJUSTMENT FOR HOT MIX ASPHALT (HMA) MIXTURES ENGLISH
AND METRIC UNITS
Revised: 07/08/2016

This provision applies to all projects using greater than 100 tons (91 megagrams) of hot mix asphalt (HMA) mixtures containing liquid asphalt cement as stipulated in the Notice to Contractors section of the bid documents.

Price Adjustments will be based on the variance in price, for the liquid asphalt component only, between the Base Price and the Period Price. They shall not include transportation or other charges. Price Adjustments will occur on a monthly basis.

Base Price

The Base Price of liquid asphalt on a project as listed in the Notice to Contractors section of the bid documents is a fixed price determined by the Department at the time of the bid using the same method as the determination of the Period Price detailed below. The Base Price shall be used in all bids.

Period Price

The Period Price is the price of liquid asphalt for each monthly period as determined by the Department using the average selling price per standard ton of PG64-28 paving grade (primary binder classification) asphalt, FOB manufacturer's terminal, as listed under the "East Coast Market - New England, Boston, Massachusetts area" section of the Poten & Partners, Inc. "Asphalt Weekly Monitor". This average selling price is listed in the issue having a publication date of the second Friday of the month and will be posted as the Period Price for that month. The Department will post this Period Price on its website at <http://www.mhd.state.ma.us/> within two (2) business days following its receipt of the relevant issue of the "Asphalt Weekly Monitor". Poten and Partners has granted the Department the right to publish this specific asphalt price information sourced from the Asphalt Weekly Monitor. This method of period price determination was formerly called the New Asphalt Period Price Method. Separate website postings using both the New Asphalt Period Price Method and the Old Asphalt Period Price Method were discontinued after June 2013.

Price Adjustment Determination, Calculation and Payment

The Contract Price of the HMA mixture will be paid under the respective item in the Contract. Price Adjustments, as herein provided, either upwards or downwards, will be made after the work has been performed using the monthly period price for the month during which the work was performed.

Price Adjustments will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

The Price Adjustment applies only to the actual virgin liquid asphalt content in the mixture placed on the job in accordance with the Standard Specifications for Highways and Bridges, Division III, Section M3.11.03.

Price Adjustments will be separate payment items. The pay item numbers are 999.401 for a positive

price adjustment (a payment) and 999.402 for a negative price adjustment (a deduction). Price Adjustments will be calculated using the following equation:

Price Adjustment = Tons of HMA Placed X Liquid Asphalt Content % X RAP Factor X (Period Price - Base Price)

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department- approved extension of time.

BASE PRICES

The Department's table of Base Prices specified above is updated monthly.

***** END OF DOCUMENT *****

DOCUMENT 01250
SPECIAL PROVISIONS

MONTHLY PRICE ADJUSTMENT FOR DIESEL FUEL AND GASOLINE – ENGLISH UNITS

Revised: 01/26/2009

This monthly fuel price adjustment is inserted in this contract because the national and worldwide energy situation has made the future cost of fuel unpredictable. This adjustment will provide for either additional compensation to the Contractor or repayment to the Commonwealth, depending on an increase or decrease in the average price of diesel fuel or gasoline.

This adjustment will be based on fuel usage factors for various items of work developed by the Highway Research Board in Circular 158, dated July 1974. These factors will be multiplied by the quantities of work done in each item during each monthly period and further multiplied by the variance in price from the Base Price to the Period Price.

The Base Price of Diesel Fuel and Gasoline will be the price as indicated in the Department's web site (www.mhd.state.ma.us) for the month in which the contract was bid, which includes State Tax.

The Period Price will be the average of prices charged to the State, including State Tax for the bulk purchases made during each month.

This adjustment will be effected only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No adjustment will be paid for work done beyond the extended completion date of any contract.

Any adjustment (increase or decrease) to estimated quantities made to each item at the time of final payment will have the fuel price adjustment figured at the average period price for the entire term of the project for the difference of quantity.

The fuel price adjustment will apply only to the following items of work at the fuel factors shown:

ITEMS COVERED	FUEL FACTORS	
	Diesel	Gasoline
Excavation: and Borrow Work: Items 120, 120.1, 121, 123, 124, 125, 127, 129.3, 140, 140.1, 141, 142, 143, 144., 150, 150.1, 151 and 151.1 (Both Factors used)	0.29 Gallons / CY.	0.15 Gallons / CY
Surfacing Work: All Items containing Hot Mix Asphalt	2.90 Gallons / Ton	Does Not Apply

BASE PRICES

The Department's table of Base Prices specified above is updated monthly.

***** END OF DOCUMENT *****

DOCUMENT 01250

SPECIAL PROVISIONS

PRICE ADJUSTMENTS FOR STRUCTURAL STEEL AND REINFORCING STEEL

March 16, 2023

This special provision applies to all projects containing the use of structural steel and/or reinforcing steel as specified elsewhere in the Contract work. It applies to all structural steel and all reinforcing steel, as defined below, on the project. Compliance with this provision is mandatory, i.e., there are no "opt-in" or "opt-out" clauses. Price adjustments will be handled as described below and shall only apply to unfabricated reinforcing steel bars and unfabricated structural steel material, consisting of rolled shapes, plate steel, sheet piling, pipe piles, steel castings and steel forgings.

Price adjustments will be variances between Base Prices and Period Prices. Base Prices and Period Prices are defined below.

Price adjustments will only be made if the variances between Base Prices and Period Prices are 5% or more. A variance can result in the Period Price being either higher or lower than the Base Price. Once the 5% threshold has been achieved, the adjustment will apply to the full variance between the Base Price and the Period Price.

Price adjustments will be calculated by multiplying the number of pounds of unfabricated structural steel material or unfabricated reinforcing steel bars on a project by the index factor calculated as shown below under Example of a Period Price Calculation.

Price adjustments will not include guardrail panels or the costs of shop drawing preparation, handling, fabrication, coatings, transportation, storage, installation, profit, overhead, fuel costs, fuel surcharges, or other such charges not related to the cost of the unfabricated structural steel and unfabricated reinforcing steel.

The weight of steel subject to a price adjustment shall not exceed the final shipping weight of the fabricated part by more than 10%.

Base Prices and Period Prices are defined as follows:

Base Prices of unfabricated structural steel and unfabricated reinforcing steel on a project are fixed prices determined by the Department and found in the table below. While it is the intention of the Department to make this table comprehensive, some of a project's unfabricated structural steel and/or unfabricated reinforcing steel may be inadvertently omitted. Should this occur, the Contractor shall bring the omission to the Department's attention so that a contract alteration may be processed that adds the missing steel to the table and its price adjustments to the Contract.

The Base Price Date is the month and year of the most recent finalized period price index at the time that MassDOT opened bids for the project. The Base Price Index for this contract is the Steel PPI listed in the Notice to Contractors.

Period Prices of unfabricated structural steel and unfabricated reinforcing steel on a project are variable prices that have been calculated using the Period Price Date and an index of steel prices to adjust the Base Price.

The Period Price Date is the date the steel was delivered to the fabricator as evidenced by an official bill of lading submitted to the Department containing a description of the shipped materials, weights of the shipped materials and the date of shipment. This date is used to select the Period Price Index.

The index used for the calculation of Period Prices is the U.S. Department of Labor Bureau of Labor Statistics Producer Price Index (PPI) Series ID WPU101702 (Not Seasonally Adjusted, Group: Metals and Metal Products, Item: Semi-finished Steel Mill Products.) As this index is subject to revision for a period of up to four (4) months after its original publication, no price adjustments will be made until the index for the period is finalized, i.e., the index is no longer suffixed with a "(P)".

Period Prices are determined as follows:

Period Price = Base Price X Index Factor

Index Factor = Period Price Index / Base Price Index

Example of a Period Price Calculation:

Calculate the Period Price for December 2009 using a Base Price from March 2009 of \$0.82/Pound for 1,000 Pounds of ASTM A709 (AASHTO M270) Grade A36 Structural Steel Plate.

The Period Price Date is December 2009. From the PPI website*, the Period Price Index = 218.0.

The Base Price Date is March 2009. From the PPI website*, the Base Price Index = 229.4.

Index Factor = Period Price Index / Base Price Index = $218.0 / 229.4 = 0.950$ Period Price = Base Price X Index Factor = $\$0.82/\text{Pound} \times 0.950 = \$0.78/\text{Pound}$

Since $\$0.82 - \$0.78 = \$0.04$ is less than 5% of \$0.82, no price adjustment is required.

If the \$0.04 difference shown above was greater than 5% of the Base Price, then the price adjustment would be 1,000 Pounds X \$0.04/Pound = \$40.00. Since the Period Price of \$0.78/Pound is less than the Base Price of \$0.82/Pound, indicating a drop in the price of steel between the bid and the delivery of material, a credit of \$40.00 would be owed to MassDOT. When the Period Price is higher than the Base Price, the price adjustment is owed to the Contractor.

* To access the PPI website and obtain a Base Price Index or a Period Price Index, go to <http://data.bls.gov/cgi-bin/srgate>

End of example.

The Contractor will be paid for unfabricated structural steel and unfabricated reinforcing steel under the respective contract pay items for all components constructed of either structural steel or reinforced Portland cement concrete under their respective Contract Pay Items.

Price adjustments, as herein provided for, will be paid separately as follows:

Structural Steel

Pay Item Number 999.449 for positive (+) pay adjustments (payments to the Contractor)

Pay Item Number 999.457 for negative (-) pay adjustments (credits to MassDOT Highway Division)
Reinforcing Steel

Pay Item Number 999.466 for positive (+) pay adjustments (payments to the Contractor)

Pay Item Number 999.467 for negative (-) pay adjustments (credits to MassDOT Highway Division)

No price adjustment will be made for price changes after the Contract Completion Date, unless the MassDOT Highway Division has approved an extension of Contract Time for the Contract.

BASE PRICES

The Department's table of Base Prices specified above is updated monthly.

DOCUMENT 01250
SPECIAL PROVISIONS
PRICE ADJUSTMENT FOR PORTLAND CEMENT CONCRETE MIXES
January 12, 2009

This provision applies to all projects using greater than 100 Cubic Yards (76 Cubic Meters) of Portland cement concrete containing Portland cement as stipulated in the Notice to Contractors section of the Bid Documents. This Price Adjustment will occur on a monthly basis.

The Price Adjustment will be based on the variance in price for the Portland cement component only from the Base Price to the Period Price. It shall not include transportation or other charges.

The Base Price of Portland cement on a project is a fixed price determined at the time of bid by the Department by using the same method as for the determination of the Period Price (see below) and found in the Notice to Contractors.

The Period Price of Portland cement will be determined by using the latest published price, in dollars per ton (U.S.), for Portland cement (Type I) quoted for Boston, U.S.A. in the Construction Economics section of ENR Engineering News-Record magazine or at the ENR website <http://www.enr.com> under Construction Economics. The Period Price will be posted on the MassHighway website the Wednesday immediately following the publishing of the monthly price in ENR, which is normally the first week of the month.

The Contract Price of the Portland cement concrete mix will be paid under the respective item in the Contract. The price adjustment, as herein provided, upwards or downwards, will be made after the work has been performed, using the monthly period price for the month during which the work was performed.

The price adjustment applies only to the actual Portland cement content in the mix placed on the job in accordance with the Standard Specifications for Highways and Bridges, Division III, Section M4.02.01. No adjustments will be made for any cement replacement materials such as fly ash or ground granulated blast furnace slag.

The Price Adjustment will be a separate payment item. It will be determined by multiplying the number of cubic yards of Portland cement concrete placed during each monthly period times the Portland cement content percentage times the variance in price between the Base Price and Period Price of Portland cement.

This Price Adjustment will be paid only if the variance from the Base Price is 5% or more for a monthly period. The complete adjustment will be paid in all cases with no deduction of the 5% from either upward or downward adjustments.

No Price Adjustment will be allowed beyond the Completion Date of this Contract, unless there is a Department-approved extension of time.

BASE PRICES

The Department's table of Base Prices specified above is updated monthly.

END OF DOCUMENT

TECHNICAL SPECIFICATIONS

TOWN OF ARLINGTON

BRIDGE NO. A-10-015, ROUTE 3 (MYSTIC STREET) OVER MILL BROOK

SPECIAL PROVISIONS TO THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION –
HIGHWAY DIVISION STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES

DIVISION II

SCOPE OF WORK

All work under this Contract shall be done in conformance with the *2024 Standard Specifications for Highways and Bridges*, the *2017 Construction Standard Details*, the *Traffic Management Plans and Detail Drawings*, *MassDOT Work Zone Safety Temporary Traffic Control*, the *1990 Standard Drawings for Signs and Supports*; the *2015 Overhead Signal Structure and Foundation Standard Drawings*, the *2023 Manual on Uniform Traffic Control Devices (MUTCD)* 11th Edition with Massachusetts Amendments; the *1968 Standard Drawings for Traffic Signals and Highway Lighting*; *The American Standard for Nursery Stock*; the Plans and these Special Provisions.

The work includes the complete replacement of the existing granite masonry and reinforced concrete culvert. The work shall include the demolition of the existing masonry and reinforced concrete, the construction of the proposed multiple steel beam with reinforced concrete deck single span bridge supported on drilled micropile supported integral abutments, the control of water during demolition and construction, bridge excavation, filter fabric, crushed stone, gravel borrow for backfilling, placed riprap, steel bridge railing, approach slabs, and paving over the proposed bridge and the approaches. The Plans consist of 25 construction drawing sheets that were reviewed and approved by MassDOT on August 1, 2022.

Traffic management required to perform the proposed work shall be as shown on the Plans. Payment for materials or work shown on the Plans or as being part of the bridge replacement which may be incidental to its construction and are not specifically included for payment under the Contract shall be considered incidental to the work performed. Where used within the contract documents, the terms “Department”, “Municipality”, and “Town” shall be taken to mean the Town of Arlington. The term “Engineer” shall be taken to mean the authorized representative or Project Manager for the Town of Arlington.

For the work specified under this Contract, the Contractor or Subcontractor(s) shall be prequalified by the Massachusetts Department of Transportation Highway Division (MassDOT) for the following classes of work:

Bridge Construction

Demolition

Ironwork shall be fabricated by a MassDOT approved fabricator of bridge components composed primarily of metal.

GENERAL REQUIREMENTS FOR DEMOLITION AND WORK INVOLVING PAINTED STEEL

Demolition and work involving painted steel shall conform to the requirements of Section 961 of the

Standard Specifications.

Work Involving Painted Steel.

Hazardous materials shall be removed in the immediate area of any intended welding, heating, saw cutting or burning of steel. Hazardous material removal is required to allow the demolition of structural steel, railings, drainage systems, utility supports, steel lamp posts, etc.

The contractor shall assume that the coatings on the steel contain lead (Pb), unless otherwise determined by testing. The contractor shall certify in writing to the Engineer the results of all testing, and shall also certify that any lead (Pb) coated steel removed from the project was not reused or buried, but was sent to a scrap metal recycling facility.

Implement and maintain programs and procedures, which comply with the requirements of this specification and all applicable standards and regulations. Comply with all applicable regulations even if the regulation is not specifically referenced herein. If a state or local regulation is more restrictive than the regulation of this specification, follow the more restrictive requirements.

This requirement is intended only for the demolition and preparation prior to repair and does not include provisions for recoating of steel.

All applicable portions of Sections 961.65 "Worker Protection" and 961.66 "Environmental Protection and Monitoring" shall be followed when performing this work.

During chemical stripping a hand washing facility may be used in lieu of a decontamination/changing facility.

Hazardous material shall be collected during the disassembly and disposed of as outlined in Section 961.68 "Handling of Hazardous Waste and Reporting Release Programs".

The applicable submittals shall be according to Section 961.69 "Submittals".

All surfaces to be welded, heated, saw cut or burned shall be cleaned so as to remove all contaminants and/or hazardous materials, which could be discharged to the environment as a function of the subsequent operations.

Lead paint shall be removed in its entirety in an area prescribed by a 6 inch (15 cm) minimum offset from the required work. The paint removal operation may be dry abrasive blasting, wet abrasive blasting or chemical stripping.

Proper level of containment shall be used when performing this work in accordance with Section 961.67 "Containment". Full containment is not required during chemical stripping operation however; the Contractor shall install proper shielding and/or tarpaulins under the chemical stripping operations in order to catch all debris generated during this procedure. A cleaned area must be inspected and approved before the demolition operations are started.

MECHANICAL DISASSEMBLY OF STEEL

All surfaces to be mechanically disassembled by shear cutting or removing bolts or rivets shall not require deleading. When shear cutting or removing bolts or rivets, the Contractor shall not use any method that will cause dust and/or particles to be emitted and/or dispersed into the environment to an extent that would expose the workers above the Action Levels of 30 μ g/m³.

For purposes of limiting the lead (Pb) dust, the Contractor will be required to dampen the lead paint work areas.

The contractor shall install a proper shielding and/or tarpaulins under all lead-paint-coated surfaces to be shear cut or bolts or rivets ordered removed in order to catch any loose lead paint chips, dust or particles.

UTILITIES

Presently there are approximately 26 existing utilities pipes or conduits that cross over the existing culvert or under Mill Brook beneath the culvert. The existing utilities located beneath Mill brook include:

2 – 10" MWRA Sewer pipes that are concrete encased and shall be maintained in place; 2 – 8" Town of Arlington steel siphon sewer pipes that shall be maintained in place;

2 – 8" Town of Arlington steel water pipes that shall be abandoned after they are replaced and supported by the new bridge.

The existing utilities located on the existing bridge include:

2 – 12" Eversource oil-filled steel pipes containing 345KV cables to be temporarily supported, maintained in place, and permanently supported on steel utility supports under the east sidewalk;

1 – 8" NGRID gas, 1 – 12" NGID gas to be replaced and supported on the new bridge;

1 – 8" abandoned NGRID gas to be removed

4 – 3 ½" Eversource electric conduits that are to be supported in placed during demolition and steel erection followed by replacement with a replacement conduit bank after steel erection;

4 – 4" steel Verizon conduits and 8 – 4" steel Verizon conduits that are to be supported in place during demolition and steel erection, laterally relocated with additional new conduit after steel erection

UTILITY RELOCATION AND COORDINATION

See "**SUMMARY OF CONTRACTOR UTILITY COORDINATION REQUIREMENTS**" on following pages.

SUMMARY OF CONTRACTOR UTILITY COORDINATION REQUIREMENTS

For 24-03 Mystic Street Bridge Reconstruction Project

The following information supersedes the scheduling and coordination requirements indicated on the UTILITY PLAN; (Sheet 21 of 25)

DESIGN PHASE: CONTRACTOR REQUIREMENTS

- CONTRACTOR TO MEET WITH ARLINGTON WATER DIVISION TO COORDINATE AND PREPARE SCHEDULE OF WATER LINE RELOCATION AND UPDATES IN CONJUNCTION WITH BRIDGE CONSTRUCTION PROJECT TIME LINE.
- CONTRACTOR TO PERFORM TEST PITS TO VERIFY LOCATION OF ALL EXISTING UTILITIES AND INFRASTRUCTURE AND IDENTIFY EXISTING UTILITIES REQUIRING TEMPORARY SUPPORT AND PROTECTION.
- UPON COMPLETION OF TEST PITS, CONTRACTOR TO PREPARE **TEMPORARY UTILITY SUPPORT PLAN** BASED on TEST PIT OBSERVATIONS FOR EACH UTILITY. TEMPORARY UTILITY SUPPORT PLANS TO BE SUBMITTED TO APPROPRIATE UTILITY FOR REVIEW AND APPROVAL PRIOR TO COMMENCEMENT OF WORK.
 - (8) existing - 4"Ø STEEL TELECOMM CONDUIT FOR APPROVAL BY VERIZON
 - (4) existing - 4"Ø STEEL TELECOMM CONDUIT FOR APPROVAL BY VERIZON
 - (2) existing - 12"Ø 345KV ELECTRIC FOR APPROVAL BY EVERSOURCE
 - (1) existing - 12" GAS MAIN FOR APPROVAL BY NATIONAL GRID

PRE-STAGE 1: CONTRACTOR REQUIREMENTS

- PLACE CONSTRUCTION SIGNING.
- REMOVE TREES AND CLEAR VEGETATION.
- INSTALL SEDIMENTATION AND EROSION CONTROL FEATURES AND COORDINATE INSPECTION BY ARLINGTON CONSERVATION AGENT.
- SUBMIT UTILITY APPROVED TEMPORARY UTILITY SUPPORT PLANS TO ENGINEER, TO INCLUDE:
 - VERIZON**
 - (8) EXISTING - 4"Ø STEEL TELECOMM CONDUIT, APPROVED BY VERIZON
 - (4) EXISTING - 4"Ø STEEL TELECOMM CONDUIT, APPROVED BY VERIZON
 - EVERSOURCE**
 - (2) EXISTING - 12"Ø 345KV ELECTRIC, APPROVED BY EVERSOURCE
 - NATIONAL GRID**
 - EXISTING - 12" GAS MAIN, APPROVED BY NATIONAL GRID
- SUBMIT TEMPORARY EARTH SUPPORT PLANS TO ENGINEER FOR APPROVAL.

STAGE 1: CONTRACTOR REQUIREMENTS

- SHIFT TRAFFIC - PLACE CONSTRUCTION SIGNS. APPLY TEMPORARY PAVEMENT MARKINGS. INSTALL TEMPORARY BARRIER AND TEMPORARY CROSSWALKS. CLOSE EAST SIDEWALK.
- DISMANTLE AND STACK EXISTING LANDSCAPE WALL AT 91 MYSTIC STREET.
- INSTALL TEMPORARY FILL RETENTION/EARTH SUPPORT.
- CONTRACTOR TO INSTALL TEMPORARY SUPPORT FOR EXISTING VERIZON DUCTBANKS IN ACCORDANCE WITH TEMPORARY UTILITY SUPPORT PLAN APPROVED BY VERIZON.

STAGE 1: CONTRACTOR REQUIREMENTS (continued)

- CONTRACTOR TO INSTALL TEMPORARY SUPPORT FOR EXISTING EVERSOURCE 345KV ELECTRIC LINES IN ACCORDANCE WITH TEMPORARY UTILITY SUPPORT PLAN APPROVED BY EVERSOURCE.
- CONTRACTOR TO INSTALL TEMPORARY SUPPORT/PROTECT 12" GAS LINE AT NORTH ABUTMENT IN ACCORDANCE WITH TEMPORARY UTILITY SUPPORT PLAN APPROVED BY NATIONAL GRID.
- PROTECT EXISTING 8" WATER MAIN.
- DEMOLISH EASTERN PORTION OF EXISTING BRIDGE. REMOVE FILL, DEMOLISH GRANITE AND CONCRETE BRIDGE DECK, REMOVE ABANDONED STEEL GAS PIPE AND DEMOLISH PORTIONS OF EXISTING STONE ABUTMENTS AND PIER.
- CONTRACTOR TO COORDINATE WITH NATIONAL GRID TO TEMPORARILY RELOCATE GAS SERVICE LINE TO 91 MYSTIC STREET.
- CONSTRUCT DRAINAGE UPGRADES, INSTALL DRAINAGE STRUCTURES AND PIPES, AND REMOVE EXISTING CATCH BASINS AND ASSOCIATED PIPING.
- INSTALL MICROPILES FOR EASTERN PORTION OF BRIDGE ABUTMENTS.
- INSTALL WATER CONTROL FOR PORTION OF ABUTMENT CONSTRUCTION.
- CONSTRUCT EASTERN PORTION OF BRIDGE ABUTMENTS.
- CONSTRUCT BRIDGE SEAT FOR EASTERN PORTION OF BRIDGE.
- ERECT STEEL BEAMS FOR EASTERN PORTION OF BRIDGE.
- CONTRACTOR TO COORDINATE WITH EVERSOURCE TO TRANSFER EXISTING EVERSOURCE 345KV ELECTRIC LINES TO PERMANENT BRIDGE SUPPORTS AND REMOVE TEMPORARY SUPPORT STRUCTURE. (EVERSOURCE)
- CONTRACTOR TO COORDINATE WITH VERIZON TO INSTALL PROPOSED VERIZON DUCTBANK ON PERMANENT BRIDGE SUPPORT (VERIZON).
- CONTRACTOR TO COORDINATE WITH VERIZON TO RELOCATE EXISTING VERIZON LINES TO NEW CONDUITS/DUCTBANK. REMOVE EXISTING CONDUITS (VERIZON).
- CONTRACTOR TO COORDINATE WITH NATIONAL GRID TO INSTALL NEW 8" AND 12" GAS PIPING ON PERMANENT BRIDGE SUPPORTS (NGRID).
- CONTRACTOR TO COORDINATE WITH NATIONAL GRID TO CONNECT EXISTING 8" AND 12" GAS MAINS TO NEW 8" AND 12" GAS PIPING ON PERMANENT BRIDGE SUPPORTS (NATIONAL GRID). (Pre-Stage 2???)
- CONTRACTOR TO COORDINATE WITH EVERSOURCE TO INSTALL NEW EVERSOURCE DUCTBANKS ON PERMANENT BRIDGE SUPPORTS (EVERSOURCE).
- CONSTRUCT EASTERN PORTIONS OF THE BRIDGE DECK AND ABUTMENT DIAPHRAGMS.
- CONSTRUCT FULL DEPTH ROADWAY AND APPROACHES.
- CONSTRUCT EASTERN SIDEWALK AND BRIDGE RAILING.

PRE-STAGE 2: CONTRACTOR REQUIREMENTS

- CONTRACTOR TO COORDINATE WITH NATIONAL GRID TO INSTALL PERMANENT GAS SERVICE LINE CONNECTION TO 91 MYSTIC STREET. CAP/REMOVE EXISTING GAS PIPES (NATINOAL GRID)
- CONTRACTOR TO COORDINATE WITH EVERSOURCE TO RELOCATE EXISTING ELECTRIC DISTRIBUTION LINES TO NEW EVERSOURCE DUCT BANKS INSTALLED ON BRIDGE.

STAGE 2: CONTRACTOR REQUIREMENTS

- SHIFT TRAFFIC - PLACE CONSTRUCTION SIGNS. APPLY TEMPORARY PAVEMENT MARKINGS. INSTALL TEMPORARY BARRIER. REMOVE TEMPORARY CROSSWALKS. OPEN EAST SIDEWALK.
- INSTALL TEMPORARY FILL RETENTION/EARTH SUPPORT.
- PROTECT SEWER SIPHON.
- CONTINUE TO PROTECT TWO EXISTING 8" WATER MAINS.
- DEMOLISH CENTER PORTION OF EXISTING BRIDGE. REMOVE FILL, DEMOLISH GRANITE AND CONCRETE BRIDGE DECK, REMOVE ABANDONED GAS PIPE AND ELECTRIC CONDUITS. DEMOLISH PORTIONS OF EXISTING STONE ABUTMENTS AND PIER.
- INSTALL MICROPILES FOR CENTER PORTION OF BRIDGE ABUTMENTS.
- INSTALL WATER CONTROL FOR PORTION OF ABUTMENT CONSTRUCTION.
- CONSTRUCT CENTER PORTION OF BRIDGE ABUTMENTS.
- CONSTRUCT BRIDGE SEAT FOR CENTER PORTION OF BRIDGE.
- ERECT STEEL BEAMS FOR CENTER PORTION OF BRIDGE.
- INSTALL PROPOSED 8" WATER MAIN ON PERMANENT BRIDGE SUPPORT.
- CONSTRUCT CENTER PORTIONS OF THE BRIDGE DECK AND ABUTMENT DIAPHRAGMS.
- CONSTRUCT FULL DEPTH ROADWAY AND APPROACHES.

PRE-STAGE 3: CONTRACTOR REQUIREMENTS

- CONNECT EXISTING 8" WATER MAIN TO NEW 8" WATER MAIN LOCATED ON BRIDGE SUPPORTS, AND CAP/ABANDON (1) EXISTING 8" WATER MAIN.

STAGE 3: CONTRACTOR REQUIREMENTS

- SHIFT TRAFFIC - PLACE CONSTRUCTION SIGNS. APPLY TEMPORARY PAVEMENT MARKINGS. INSTALL TEMPORARY CONCRETE BARRIER AND TEMPORARY CROSSWALKS. CLOSE WEST SIDEWALK.
- PROTECT EXISTING MWRA SEWER.
- CONTRACTOR TO COORDINATE WITH EVERSOURCE TO SUPPORT EXISTING UTILITY POLE IN PLACE.
- ABANDON ELECTRICAL CONDUITS (BY OTHERS).

STAGE 3: CONTRACTOR REQUIREMENTS (continued)

- DEMOLISH WESTERN PORTION OF EXISTING BRIDGE. REMOVE FILL, DEMOLISH GRANITE AND CONCRETE BRIDGE DECK, REMOVE ABANDONED STEEL GAS PIPE, ABANDONED EVERSOURCE DUCT BANKS AND DEMOLISH PORTIONS OF EXISTING STONE ABUTMENTS AND PIER.
- CONSTRUCT DRAINAGE UPGRADES, INSTALL DRAINAGE STRUCTURES AND PIPES, AND REMOVE EXISTING
- INSTALL CATCH BASINS AND ASSOCIATED PIPING.
- INSTALL MICROPILES FOR WESTERN PORTION OF BRIDGE ABUTMENTS.
- INSTALL WATER CONTROL FOR PORTION OF ABUTMENT CONSTRUCTION.
- CONSTRUCT WESTERN PORTION OF BRIDGE ABUTMENTS.
- CONSTRUCT BRIDGE SEAT FOR WESTERN PORTION OF BRIDGE.
- ERECT STEEL BEAMS FOR WESTERN PORTION OF BRIDGE.
- INSTALL PROPOSED 8" WATER MAIN ON PERMANENT BRIDGE SUPPORT.
- CONNECT EXISTING 8" WATER MAIN TO NEW 8" WATER MAIN LOCATED ON BRIDGE SUPPORTS, AND CAP/ABANDON (1) EXISTING 8" WATER MAIN.
- CONSTRUCT WESTERN PORTIONS OF THE BRIDGE DECK AND ABUTMENT DIAPHRAGMS.
- CONSTRUCT FULL DEPTH ROADWAY AND APPROACHES.
- CONSTRUCT WESTERN SIDEWALK AND BRIDGE RAILING.

POST STAGE 3:

- ADJUST DRAINAGE AND SEWER STRUCTURES TO FINAL GRADE.
- ADJUST ELECTRIC STRUCTURES TO FINAL GRADE. (EVERSOURCE) (BY OTHERS)
- ADJUST TELEPHONE STRUCTURES TO FINAL GRADE. (VERIZON) (BY OTHERS)
- ROADWAY MILLING, PAVING, PAVEMENT MARKINGS.
- LOAM AND SEED. RECONSTRUCT RETAINING WALL.
- FINAL CLEAN UP
- REMOVE TEMPORARY CONCRETE BARRIER, TEMPORARY CROSSWALKS, AND CONSTRUCTION SIGNING.

PLANS AND DETAIL DRAWINGS

(*Supplementing Subsection 5.02*)

Plans of the existing bridge, A-10-015, are not available. Inspection Reports that were prepared by MassDOT are included with the Bid Documents.

The Contractor shall perform his/her own investigation of the existing culvert to determine its condition and details.

WORK SCHEDULE:

The Contractor shall adhere to requirements of Town Bylaws as they adhere to construction activities. Particularly **Town Bylaw, Title V, Article 12 Noise Abatement**.

Standard Work Hours are as follows:

Monday to Friday: 8:00AM to 6:00PM

Saturday and Sunday: 9:00am to 5:00PM

Exemptions:

Contractor may request an exemption for work hours outside of the operating hours set forth above with a request for permission to, and approval by the Town Manager.

Contractor shall provide a detailed summary of work requirements related to the proposed work hours to the Engineering Division and Police Department Traffic Unit for initial review. If acceptable and found to be in the best interest of the Town in terms of traffic, safety, coordination, will be provided to the Town Manager for consideration. If approved the Contractor shall prepare abutter notices setting forth the date, time, and expected nature of the work to be performed. Notices must be delivered by mail or hand delivery to each residential unit within 500 ft of the work Zone at least two (2) business days in advance of the proposed work.

Work on a Holiday or on the day before or the day after a long weekend which involves a Holiday requires prior approval by the Engineer and Police Department Traffic Unit. Times will need to be submitted in advance for approval. No work, effecting traffic, shall be done from Friday afternoon / evening to Monday morning without prior approval of the Engineer. Set-up and removal of all equipment and materials for construction and/or traffic maintenance shall be done only during the prescribed work hours described below for the particular work being done. The roadway shall be otherwise free of the Contractor's personnel and operations.

No nighttime work will be allowed on Fridays unless otherwise approved by the Engineer. Particular care shall be taken to establish and maintain methods and procedures that will not create unnecessary or unusual hazards to public safety. Traffic control devices required only during working hour operations shall be removed at the end of each working day.

The Contractor shall give notice to the Engineer and Police Department Traffic Unit at least 48 hours in advance of beginning any work affecting the maintenance of traffic. The Contractor shall not proceed with surfacing operations without specific notice to and the approval of the Engineer.

Lane closures required for set up and removal of the Contractor's equipment/materials or lane closures for other construction operations shall be done only during permitted hours. Additionally, all lane closures must be approved, by the Engineer and Police Department Traffic Unit, in advance. Set-up and removal of all equipment and materials for construction and / or traffic maintenance shall be done only during working hours for the particular work being done. The roadway shall be free of the

Contractor's personnel, equipment, materials and operations during non-work hours.

PROTECTION OF UTILITIES AND PROPERTY

(Supplementing Subsection 7.13)

The bridge plans may indicate the location of existing known utilities in the vicinity of the work. Bidders are cautioned to verify this information, as its accuracy and completeness are not guaranteed in any manner.

The Contractor is responsible for the protection of vehicular and pedestrian areas on and around the bridge being worked on. The Contractor at no additional compensation (unless otherwise, provided in this Contract) shall take all necessary precautions, including the use of shielding, to protect vehicles and pedestrians from debris.

NOTICE TO OWNERS OF UTILITIES

Written notice shall be given by the Contractor to all public service corporations or officials owning or having charge of publicly or privately owned utilities of his intention to commence operations affecting such utilities at least one week in advance of the commencement of such operations in accordance with Chapter 82, Section 40 of the General Laws, as amended, and the Contractor shall at that time file a copy of such notice with the Engineer.

The Contract Plans indicate the approximate location of known utilities in the vicinity of the work. The accuracy and completeness of the information is not guaranteed.

Any damage to these utilities caused by negligence of the Contractor shall be repaired by him at his own expense and to the satisfaction of the Engineer.

It is the intent of these Special Provisions that the Contractor having been given due notice hereof will safeguard the utilities during construction and shall assume liability for damage, relieving the Town of Arlington from any liability.

Following are the names of owners and representatives of the principal utilities presumed affected, but the completeness of this list is not guaranteed.

UTILITY COMPANIES

Town of Arlington

Town Engineer:
Wayne Chouinard, P.E.,
51 Grove Street
Arlington, MA 02476
781-316-3320

Arlington, MA 02474

Fire Chief Kevin Kelley
781-316-3800

Water & Sewer Division:

51 Grove Street
Arlington, MA 02476
Bryan Mount
781-316-3301

MWRA
2 Griffin Way
Chelsea MA 02150
Ralph Francesconi
617-305-5827

Arlington Fire Alarm:

112 Mystic Street,

Eversource Electric
Eversource Electric A:
1165 Massachusetts Avenue
Dorchester MA 02125
Terence Doonan
617-541- 5714

Eversource Fiber
247 Station Drive
Mail Stop: SUM SE 320,
Westwood MA, 02090
Tomi Fadipe
781-441-3864

National Grid Gas
40 Sylvan Road
Waltham, MA 02451
Melissa Owens
781-907-2845

Verizon
385 Myles Standish Blvd.
Taunton, MA 02780
Karen Mealey
774-409-3160

Comcast (Xfinity)
Comcast Cable Corporation
PO Box 6505
5 Omni Way
Chelmsford MA 01824
Wendy Brown
978- 848-5163

RCN (Astound)
956 Massachusetts Avenue
Arlington MA, 02476
Alex Ortiz
781-316-8878

ENVIRONMENTAL PERMITTING

The Contractor is advised that a MassDEP WPA 3 Notice of Intent was submitted to the Arlington Conservation Commission for this project. The MA DEP File #091-0349 was issued and a MassDEP WPA Form 5 – Order of Conditions was issued for this project by the Arlington Conservation Commission on February 23, 2023.

Contractor shall adhere to all requirements and conditions with the Order of Conditions included in the bid documents. See Appendix

PROTECTION OF UNDERGROUND FACILITIES

The Contractor's attention is directed to the necessity of making his own investigation in order to assure that no damage to existing structures, drainage lines, traffic signal conduits, et cetera, will occur.

The Contractor shall notify Massachusetts DIG SAFE and procure a Dig Safe Number for each location prior to disturbing existing ground in any way. The telephone number of the Dig Safe Call Center is 811 or 1-888-344-7233

ARCHITECTURAL ACCESS BOARD TOLERANCES

The Contractor shall be responsible for constructing all project elements in strict compliance with the current AAB/ADA rules, regulations and standards.

All construction elements in this project associated with sidewalks, walkways, wheelchair ramps and curb cuts are controlled by 521CMR - Rules and Regulations of the Architectural Access Board (AAB).

The AAB Rules and Regulations specify maximum slopes and minimum dimensions required for construction acceptance. There is no tolerance allowed for slopes greater than the maximum slope nor for dimensions less than the minimum dimensions.

Contractors shall establish grade elevations at all wheel chair ramp locations, and shall set transition lengths according to the appropriate table in the Construction Standards (or to the details shown on the plans).

All wheelchair ramp joints and transition sections which define grade changes shall be formed, staked and checked prior to placing cement concrete. All grade changes are to be made at joints.

DESIGNER

Daniel S. Crovo, P.E.

dcrovo@gill-eng.com

Gill Engineering Associates, Inc.

63 Kendrick Street

Needham, MA 02494

978-777-0407

TECHNICAL SPECIFICATIONS

ITEM 100. SCHEDULE OF OPERATIONS - FIXED PRICE(\$14,000) LUMP SUM

General Requirements

For Definition of Terms, see Subsection 8.02.B.

This Contract requires that a schedule control program be instituted by the Contractor to create a construction schedule that tracks and documents the progress of the Work from Notice to Proceed (NTP) through Final Acceptance.

This program requires the following schedule submittals to be made by the Contractor:

- Contract Progress Schedules
- Short-Term Construction Schedules
- Summary Contract Progress Schedules Time
- Entitlement Analyses
- Recovery Schedules

The Contractor shall use computer software capable of preparing, statusing and revising Critical Path Method (CPM) schedules using precedence diagramming methods as approved by the Engineer.

The software shall be capable of printing activity reports and plotting CPM time-scaled logic diagrams, both of which shall be sortable by structures, facilities, subcontractors, submittals, deliveries, change orders and any other critical features of the Contract.

Within seven (7) Calendar Days after NTP, the Contractor shall submit to the Engineer sufficient information demonstrating that the CPM software it proposes to use on the Contract is fully capable of producing the specified schedules and tracking tools. The Engineer shall notify the Contractor in writing within seven (7) Calendar Days after receipt of the Contractor's notification on software (within fourteen (14) Calendar Days after NTP) if there are any objections to the CPM software selected.

The Basis of Payment for this work is shown in Subsection 8.02.F.

Definition of Terms

Activity - An element in the Contract Progress Schedule describing a discrete part of the Work and establishing the time required for completing that part of the Work.

Baseline Contract Progress Schedule - The initial version of the Contract Progress Schedule, accepted by the Department, with or without comments, and showing the Contractor's plan for completion of the Work within the Contract Time in effect at the start of the Contract.

Calendar Day - Any day of the year, regardless of whether or not work is performed by the Contractor, which day of the week on which it falls, or whether or not it is a holiday.

Critical Path - Any continuous sequence of activities in the Contract Progress Schedule that controls achievement of a Contract Milestone and/or the Contract Completion Date.

Construction Schedule - The Schedule which shows the Contractor's approach to planning, scheduling, and execution of the Work, referred to herein as the Contract Progress Schedule.

Contract Milestone - A Contract Milestone is a significant and key instant of time with a zero (0)

duration that highlights progress made on the project. Contract Milestones are specified in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents.

Contract Progress Meeting - A weekly or every other week schedule meeting to review the progress on the Short-Term Construction Schedule, including, but not limited to, the actual completion percentage, a comparison of actual dates with early dates, and any additional information deemed pertinent for a full and complete discussion of the Short-Term Construction Schedule. See also Subsection 8.02.E.6.

Contract Progress Schedule - The Contract Progress Schedule shows how the Work is to be completed from Notice to Proceed through Final Acceptance. Contract Progress Schedules may be Baseline, Revised, or Statused versions. See also Subsections 8.02.E.3 - 5.

Contract Progress Schedule of Record - The Contract Progress Schedule of Record is the latest Contract Progress Schedule accepted by the Engineer and is the official schedule of the project.

CQE - Contract Quantity Estimate or pay estimate that occurs every two (2) weeks. Also known as the progress payment.

CPM - Critical Path Method is a computerized construction project planning and scheduling process where a construction project schedule's critical path is the longest chain or path of activities leading to project completion.

Delays - Any slippage of the Early Dates in the Contract Progress Schedule which forecast a slippage in the Contract Milestone and/or the Contract Completion Date.

Early Completion Schedule - A CPM schedule showing completion of the Work ahead of the Contract Completion Date specified in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents.

Early and Late Dates - Early start or completion times and late start or completion times for the performance of activities in the Contract Progress Schedule.

Extra Work Order. A Contract Modification adding money and associated necessary time to the Contract. See also Subsection 8.10.B.1.

Final Acceptance - Full and complete satisfaction of the Contract Requirements, consisting of completion and acceptance of all physical work and submission and acceptance of all contractually-required reports and other documentation. See also Subsection 5.11.

Float - Float shall be defined as the amount of time between when an activity can start or finish (Early Start or Early Finish Date) and when an activity must start or finish (Late Start or Finish Date.) Float is further defined as the amount of time any given activity or path of activities may be delayed before it will affect the Contract Time. Float belongs to the project and is a shared commodity between the Department and the Contractor and is not for the exclusive use or benefit of either party. Either party has full use of the float until it is depleted. The float may be claimed by whichever party first demonstrates a need for it, i.e., that any activities on the critical path, where float equals zero, any Contract Milestones and/or the Contract Completion Date have been delayed. The Contractor shall demonstrate this need in a Time Entitlement Analysis meeting the requirements of Subsection 8.02.E.8.

Fragnet - a mini-schedule or sub-network containing a logically-linked group of activities or durations that illustrate a distinct event or period of time in the Contract Progress Schedule. Fragnets are typically used as the schedule portion of a Time Entitlement Analysis (TEA) and are required to be

submitted as part of a TEA. See also Subsection 8.02.E.8.

Logic Diagram - A logic diagram is a type of construction project schedule that shows the progression of the work as a network where activities are linked by arrows with the tail of the arrow connected to the predecessor activity and the head of the arrow connected to the successor activity. Logic diagrams may be either time-scaled or non-time-scaled.

NTP - Notice to Proceed. A letter sent to a contractor after Contract Award by the Director of Contracts and Records containing the contractual start and completion dates. The date of this letter is referred to as the NTP Date.

Pay Estimate - See CQE.

Preliminary Schedule - The Preliminary Schedule is a summary-level Contract Progress Schedule that shows how the Contractor plans to perform the Work for the first one hundred and twenty (120) Calendar Days of the Contract on a detailed basis and how it plans to perform the remaining portion of the Work from Notice to Proceed to Final Acceptance on a less-detailed basis. See also Subsection 8.02.D.

Recovery Schedule - A Recovery Schedule is a detailed Revised Contract Progress Schedule that changes the Contract Progress Schedule of Record to show how the Contractor plans to recover from or make up the contract time lost on the project's critical path due to a delay. See also Subsection 8.02.E.9.

Revised Contract Progress Schedule - A Revised Contract Progress Schedule incorporates activities, logic ties, and relationships added to or deleted from the Contract Progress Schedule of Record based on a Time Entitlement Analysis accepted by the Engineer. See also Subsections 8.02.E.4 and 8.02.E.8.

Short-Term Construction Schedule - A Short-Term Construction Schedule details the daily work activities for a thirty-five (35) Calendar Day period, the two (2) weeks prior to the Contract Progress Meeting and the three (3) weeks following the meeting in a bar chart format. The daily activities shall correspond to the Contract Progress Schedule activities, but shall be at a greater level of detail. See also Subsection 8.02.E.6.

Statused Contract Progress Schedule - A Statused Contract Progress Schedule is a monthly update of the Contract Progress Schedule of Record. See also Subsection 8.02.E.5.

Substantial Completion - Substantial Completion occurs when either the Work has been completed except for work having a Contract Price of less than one (1) percent of the adjusted Total Contract Price or substantially all of the Work has been completed and opened to public use, except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the Work. See also Subsection 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes.

Summary Contract Progress Schedule - A Summary Contract Progress Schedule is a separate and distinct schedule based upon the internal coding of the Contract Progress Schedule. This coding shall allow a summary-level Contract Progress Schedule to be produced that identifies major physical classes, structures, facilities, and/or other elements of the Work as discussed in Subsection 8.02.E.1. See also Subsection 8.02.E.7.

Time Entitlement Analysis (TEA) - A method of schedule delay analysis that shows the impacts of a particular delay by arranging the affected activities in a timeline of when the delay occurred. This

allows the effect of a particular event or delay to be determined and illustrated. Fragments are typically used as the schedule portion of a Time Entitlement Analysis (TEA) and are required to be submitted as part of a TEA. See also Subsection 8.02.E.8.

Work Day - Any day of the week on which work is performed by the Contractor, including Saturdays and Sundays, but excluding holidays observed by the Contractor.

Schedule Reviews

The Engineer will respond to each schedule submittal within fifteen (15) Calendar Days of receipt providing comments and disposition that either accepts the schedule or requires revision and resubmittal.

Schedules shall be resubmitted within fifteen (15) Calendar Days after receipt of the Engineer's comments.

The planning, scheduling, and execution of the Work and the accuracy of their representation in the Contract Progress Schedule shall remain the sole responsibility of the Contractor.

Failure to submit schedules as and when required could result in the withholding of full or partial pay estimate payments by the Engineer.

Contract Progress Schedules

1. Requirements for all Contract Progress Schedules

The Contract Progress Schedule shall show the Work being completed in accordance with the Contract Milestones contained in Special Provisions Subsection 8.03 – Prosecution of Work.

All Contract Progress Schedules listed in Subsection 8.02.A and described in Subsections 8.02.E.3 thru .9, shall clearly define the progression of the Work from Notice to Proceed to Final Acceptance by using separate activities for each of the following items:

Notice to Proceed

Each component of the Work

Procurement of permit modifications by the Contractor or the Engineer

The preparation and submission of shop drawings and other required submittals, the duration of which shall be determined by the Contractor

The review and return of shop drawings and other required submittals, approved or with comments, the duration of which shall be a minimum of thirty (30) Calendar Days, unless otherwise approved by the Engineer

Items to be paid, such as, engineering work, permanent materials and permanent equipment (material on hand), unfabricated structural steel (raw materials), equipment procurement, and equipment delivery to the site or storage location

Interfaces with adjacent work, utility companies, other public agencies, sensitive abutters, and/or any other third party work affecting this Contract

Interim Milestones listed in Subsection 8.03 - Prosecution of Work or elsewhere in the Contract Documents

The critical path, clearly defined and labeled

Float shall be clearly identified as defined in Subsection 8.02.B

Substantial Completion per the requirements of Subsection 7.15 - Claims Against Contractors for Payment of Labor, Materials and Other Purposes Punchlist Completion Period

Physical Completion per the requirements of Subsection 5.11 - Final Acceptance Documentation Completion per the requirements of Subsection 5.11 - Final Acceptance Final Acceptance per the requirements of Subsection 5.11 - Final Acceptance

The work activities shall be in sufficient detail to support the pay estimate for that period, including all activities which the Contractor is required to perform or plans to perform and for which the Contractor intends to receive payment as specified in Subsection 9.01 – Measurement of Quantities.

All Contract Progress Schedules listed in Subsection 8.02.A and described in Subsections 8.02.E.3 through 8.02.E.9 shall also fully conform to the following requirements:

D. LOGIC: The Contract Progress Schedule shall divide the Work into activities with appropriate logic ties, to show; (i) the Contractor's overall approach to the planning, scheduling and execution of the Work, (ii) consistency with the requirements of this Subsection, (iii) the Contractor's approach to conformance with any sequences of Work required by the Contract Documents, including, but not limited to, Subsection 8.03 - Prosecution of Work and Subsection 8.06 – Limitations of Operations.

E. ACTIVITIES: The Contract Progress Schedule shall clearly and separately define the progression of Work from Notice to Proceed to Final Acceptance by using separate activities as described in Subsection 8.02.E.1.

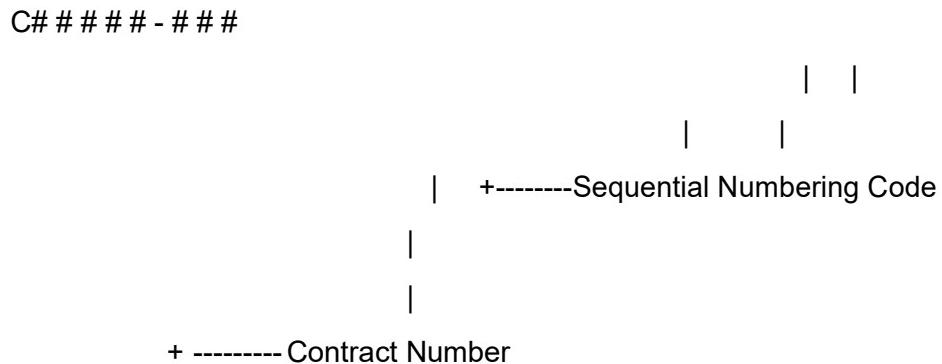
F. EARLY AND LATE DATES: Early Dates consist of Early Start and Early Finish dates. The Early Start date is the earliest date an activity can start or commence. The Early Finish date is the earliest date an activity can finish or be completed. Late Dates consist of Late Start and Late Finish dates. The Late Start date is the latest date an activity can start without delaying or lengthening the duration of the project. The Late Finish date is the latest date an activity can finish or be completed without delaying or lengthening the duration of the project.

G. DURATIONS: Activity durations shall be in Work Days. Durations shall be regulated by a work breakdown structure (WBS) of physical elements of the Work determined by work discipline, station number, or structure, which reflect the time the Contractor and/or Subcontractor(s) require to perform the related work.

H. ITEMS TO BE PAID: The Contractor shall specifically identify in the Contract Progress Schedule all items of permanent materials and equipment (Materials On Hand) for which the Contractor intends to request payment, in accordance with Subsection 9.04 - Partial Payments, prior to the incorporation of such items into the Work.

I. ACTIVITY DESCRIPTIONS: The Contractor shall use standard activity descriptions in all Contract Progress Schedules that clearly describe the work to be performed using a combination of words, structure numbers, station numbers, bid item numbers, work breakdown structure (WBS) and/or elevations in a concise and compact label.

J. ACTIVITY IDENTIFICATION NUMBERS: The Contractor shall use the standard activity identification numbering system specified below for all activities in all Contract Progress Schedules:



Contract Number - The first seven (7) characters of the activity identification number shall consist of a "C" for Contract followed by the five (5) digit Department contract number and ended with a dash.

Sequential Numbering Code - The second set of characters in the activity identification number, the actual number of characters to be determined by the Contractor, shall consist of a sequential numbering system created by the Contractor denoting work breakdown structure (WBS), locations, station numbers, major areas of construction, structure types, structure designations, class of work, type of activity, bid item number, milestone number, phase of the Work and/or any other type of information that the Contractor wishes to include in its activity identification numbering code.

K. ACTIVITY CODES: The Contractor shall use all of the following sortable standard activity codes in all Contract Progress Schedules:

Code	Code Designation
DIST	MassDOT Highway Division District Number
TOWN	City / Town Name
MSNO	Contract Milestone Number Designation
BIDI	Bid Item Number Designation
STRUC	Type of Structure Designation
RESP	Organization Responsibility Code
OTHR	Other Field
PHAS	Phase of the Work or of the Construction Schedule

DIST – MassDOT Highway Division District Number: A one-digit code corresponding to the MassDOT Highway Division District in which the project is located:

1. MassDOT Highway Division District 1
2. MassDOT Highway Division District 2
3. MassDOT Highway Division District 3
4. MassDOT Highway Division District 4
5. MassDOT Highway Division District 5
6. MassDOT Highway Division District 6

S MassDOT Highway Division Statewide

TOWN - City / Town Name: A four letter code using the first four letters of the name of the city or town in which the project is located.

Example:

MANS Mansfield

MSNO – Contract Milestone Number Designation: A two digit code corresponding to the Contract Milestone number contained in Subsection 8.03 - Prosecution of Work that is at the end of the activity's sequence chain.

Example:

03 Milestone No. 3 – Substantial Completion

BIDI – Bid Item Number Designation: A seven digit code corresponding exactly, including periods and spaces, to the bid item number with which the activity is associated.

Examples:

975.3 Metal Bridge Railing

PCM Activity added by Proposal or Contract Modification

PROJ – Primary Project Type: A one (1) or two (2) letter code corresponding to the primary project type or type of structure as shown below. Additional codes may be added by the Contractor as approved by the Engineer.

BC Bridge Modification or Rehabilitation

BN Bridge New

BR Bridge Replacement

BP Bike Path

CB Catch Basin

D Demolition

H Highway Reconstruction (local road or state highway)

HI Highway Reconstruction (interstate highway)

P Painting

R Resurfacing

TS Traffic Signals

TU Tunnels

U Utilities

V Vertical Construction (Chapter 149)

RESP – Organization Responsibility Code: A one (1) to five (5) digit code corresponding to the initials of the organization responsible for performing the work contained in the activity. Examples of this coding are:

MIW McGrath Iron Works

BCEC Bay City Electric Company

MBTA Massachusetts Bay Transportation Authority

CSX CSX Railroad Corporation

MDOT Massachusetts Department of Transportation Highway Division

OTHR – Other Field: A seven (7) digit code reserved for the exclusive use of the Engineer as required for coding miscellaneous items such as contract modifications, submittal activities, time and material work, force account work or other category of work activity that may prove to need such coding during the progress of the Work.

XXXXXXX A description of something other than the above.

L. CAENDARS: Different calendars may be created and assigned globally, i.e., applying to all activities, or individually to each activity. Calendars define the available hours of work in each Calendar Day, Holidays and general or project-specific non-Work Days. Examples of non-Work Days include, but are not limited to:

Winter Shutdown Period: December 1 thru March 15. This may be optional depending on any requirements that may be stated elsewhere in this Contract.

Peak traffic hours on heavily traveled roadways

Special requirements by sensitive abutters, railroads, utilities and/or other state agencies.

Cape Cod Summer Roadway Work Restrictions: While these restrictions may be project-specific based on such factors as the exact location of the project, whether or not the roadway involved has a high traffic volume and/or is a main route, its proximity to beaches and other popular tourist attractions, and its overall impacts on traffic and tourism, they are generally enforced between Memorial Day and Labor Day, unless otherwise directed by the Engineer.

Cape Ann Summer Roadway Work Restrictions: While there are no general restrictions for Cape Ann as there are for Cape Cod, project-specific restrictions may be enforced based on the same factors listed above for Cape Cod.

Turtle and Fish Migration Periods and/or other in-water work restrictions: Project-specific
Working over Waterways Restricted Periods: Project-specific

Night-time paving and striping operations temperature restrictions: Project-specific

M. NOT TO BE USED: Unspecified milestones or constrained dates, scheduled work not required for the accomplishment of a Contract Milestone, use of activity durations, logic ties and/or sequences deemed unreasonable by the Engineer, delayed starts of follow-on trades, or use of float suppression techniques contrary to the provisions of Subsection 8.05 – Claim for Delay or Suspension of the Work shall not be used in the Contractor's Progress Schedule.

N. FLOAT: See Subsection 8.02.B.

O. THIS SECTION NOT USED.

2. Contract Progress Schedule Reporting and Submittal Requirements

All Contract Progress Schedules listed in Subsection 8.02.A and described in Subsections 8.02.E.3 through 8.02.E.9 shall be prepared and submitted in accordance with the requirements listed below.

Each Contract Progress Schedule submittal shall be uniquely identified.

Contract Progress Schedules shall be prepared using the computerized construction scheduling software described in Subsection 8.02.A and approved by the Engineer.

All Contract Progress Schedule submittals shall include each of the following documents, prepared in two formats; copied to three (3) compact discs (CD) and three (3) copies plotted

on paper, for distribution as follows: one (1) copy each for the Boston Construction, District Construction and Resident Engineer's Offices:

L. Narratives

A Narrative is a written description of the schedule that shall:

- 8 itemize and describe the flow of work for all activities on the Critical Path;
- 9 compare Early and Late Dates for activities on the Critical Path;
- 10 show progress highlights and quantify Work Days gained or lost versus the Contract Progress Schedule of Record;
- 11 describe the Contractor's plan, approach, methodologies, and resources to be employed for completing the various operations and elements of the Work;
- 12 Itemize shifts, Holidays, and if multiple calendars are applied to the activities, uniquely identify each calendar.

M. Bar Charts

Time-scaled bar charts shall be prepared using a scale that yields readable plots and that meet the requirements of Subsection 8.02.E.1. Activities shall be linked by logic ties and shown on the Early Dates. Critical paths shall be highlighted and Total Float shall be shown for all activities. The paper plots of schedule Bar Charts shall be as follows:

- 24" X 36"-sized paper shall be used for Baseline Schedules, Revised Contract Progress Schedules and Recovery Schedules;
- 11" X 17" - sized paper shall be used for all other schedule types and Time Entitlement Analyses. These may be submitted as a .pdf file, if approved by the Engineer.

N. Time-scaled Logic Diagrams

Time-scaled logic diagrams shall be prepared using a scale that yields readable plots and that meet the requirements of Subsection 8.02.E.1. Activities shall be linked by logic ties and be shown on the Early Dates. Critical paths shall be highlighted and Total Float shall be shown for all activities. Paper plots of time-scaled logic diagrams shall be submitted as stated in Subsection 8.02.E.2.b - Bar Charts

O. Detailed Activity Schedule Comparisons

A Detailed Activity Schedule Comparison is a simple reporting tool in the format of a graphical report that will provide Resident Engineers with immediate, timely and up-to-date information.

The Detailed Activity Schedule Comparison consists of an updated bar chart that overlays the previous time period's bar chart for an easily-read comparison of progress during the present and previous reporting periods. Simple instructions for creating Detailed Activity Schedule Comparisons appear on the MassDOT Highway Division website at: <http://www.massdot.state.ma.us/Highway/>

P. THIS SECTION NOT USED.

Q. THIS SECTION NOT USED.

R. THIS SECTION NOT USED.

3. Baseline Contract Progress Schedule

The Baseline Contract Progress Schedule shall be due seventy-five (75) calendar days after Notice to Proceed. The Baseline Contract Progress Schedule shall only reflect the Work awarded to the Contractor and shall not include any additional work involving extra work orders or any other type of alleged delay.

The Baseline Contract Progress Schedule shall be prepared and submitted in accordance with Subsections 8.02.E.1 and 8.02.E.2.

Once the Baseline Contract Progress Schedule has been accepted by the Engineer, with or without comments, it will represent the as-planned schedule for the Work. It shall then be known as the Baseline Schedule and shall be the Contract Progress Schedule of Record until such time as the schedule is updated or revised under Subsections 8.02.E.4 and 8.02.E.5.

Failure to submit a Baseline Contract Progress Schedule within seventy-five (75) Calendar Days after Notice to Proceed could result in withholding of full or partial pay estimate payments by the Engineer. Beyond one-hundred and fifteen (115) Calendar Days after Notice to Proceed, no pay estimate will be approved by the Engineer until the Baseline Contract Progress Schedule has been submitted, unless otherwise agreed to by the Engineer.

4. Revised Contract Progress Schedules

Upon review and acceptance by the Engineer of revised activities and/or logic ties contained in Time Entitlement Analyses prepared in accordance with Subsection 8.02.E.8 or Recovery Schedules prepared in accordance with Subsection 8.02.E.9, these changes shall be incorporated into the next Statused Contract Progress Schedule as a Revised Contract Progress Schedule. A Revised Contract Progress Schedule shall be due with the pay estimate immediately following the Engineer's acceptance of the schedule changes.

Revised Contract Progress Schedules shall include a comprehensive listing of all activities added to or deleted from the Contract Progress Schedule of Record as well as a complete listing of all logic and activity relationship changes which have been made. All changes shall be clearly highlighted and identified and explained and justified in writing as part of the Contract Progress Schedule Narrative required in Subsection 8.02.E.2.a.

Revised Contract Progress Schedules shall be prepared and submitted in accordance with Subsections 8.02.E.1 and 8.02.E.2.

Once a Revised Contract Progress Schedule has been returned by the Engineer to the Contractor as "Resubmittal Not Required", it shall become the Revised Contract Progress Schedule of Record, meaning it shall be used for subsequent Statused Contract Progress Schedules.

Except as otherwise designated by a Contract Modification, no Revised Contract Progress Schedule that extends performance beyond the Contract Time and/or any Contract Milestone shall qualify as a Revised Contract Progress Schedule of Record.

5. Statused Contract Progress Schedules

Statused (Updated) Contract Progress Schedules shall be submitted by the Contractor along with the first pay estimate of each month.

A Statused Contract Progress Schedule shall consist of the following:

10 A Summary Contract Progress Schedule consistent with Subsection 8.02.E.7.

Each Statused Contract Progress Schedule shall reflect updated progress to the status date and shall forecast the finish dates for in-progress activities and remaining activities, but shall not change any activity descriptions, durations, or sequences without the acceptance of the Engineer. Updated progress shall be limited to as-built sequencing and as-built dates for completed and in-progress activities. As-built data shall include actual start dates, remaining Work Days, and actual finish dates for each activity.

Statused Contract Progress Schedules shall be prepared and submitted in accordance with Subsections 8.02.E.1 and 8.02.E.2 along with the first pay estimate of the month, but no later than fourteen (14) Calendar Days after the pay estimate submittal.

Accepted Statused Contract Progress Schedules shall update and replace the Contract Progress Schedule of Record.

Statused Contract Progress Schedules submitted later than fourteen (14) Calendar Days after the pay estimate submittal will be deemed to be no longer useful and will not qualify for payment. However, failure to submit a Statused Contract Progress Schedule within any monthly period, whether on time or late, could result in the withholding by the Engineer of the remainder of the pay estimate payment due for that time period.

6. Short Term Construction Schedule

The Contractor shall provide a Short Term Construction Schedule that details the daily work activities, including multiple shift work that the Contractor intends to conduct, in a bar chart format. The daily activities shall correspond to the Contract Progress Schedule activities, but shall be at a greater level of detail.

The Short-Term Construction Schedule shall be submitted at each Weekly or Bi-Weekly (every two (2) weeks) Contract Progress Meeting, but, regardless of the frequency of progress meetings, shall be submitted no less often than once every two (2) weeks. It shall display all work for a thirty-five (35) Calendar Day period: completed work for the two (2) week period prior and all planned work for the three (3) week period following the Contract Progress Meeting or the end of the previous two (2) week period.

The Contractor shall be prepared to discuss the Short Term Construction Schedule, in detail, with the Engineer in order to coordinate field inspection staff requirements, schedule of work affecting abutters, and corresponding work with affected utilities.

Short Term Construction Schedules shall be prepared and submitted in accordance with Subsections 8.02.E.1 and 8.02.E.2.

Failure to submit Short Term Construction Schedules at each Contract Progress Meeting could result in withholding of full or partial pay estimate payments by the Engineer.

7. Summary Contract Progress Schedule

The Summary Contract Progress Schedule is not a separate, stand-alone schedule that must be formally submitted by the Contractor, unless requested by the Engineer, but is a schedule that is created using the internal coding of the detailed Contract Progress Schedule. The Contract Progress Schedule shall be coded such that a summary-level Contract schedule may be produced that identifies major physical classes, structures, facilities or other elements of the Work as discussed in Subsection 8.02.E.1. The durations of summary activities shall coincide with the

Contract Time and Contract Milestones shown in Subsection 8.03 - Prosecution of Work. The activity descriptions for all summary-level activities shall be subject to the review and acceptance of the Engineer.

8. Time Entitlement Analysis

A Time Entitlement Analysis (TEA) consists of a descriptive narrative, prepared in accordance with Subsection 8.02.E.2.a, and an as-built CPM schedule, in the form of a fragnet, see Subsection 8.02.B - Definition of Terms, that has been developed from the project's Contract Progress Schedule of Record, see Subsections 8.02.E.3-5, and illustrates the impact that additional time, added to the Contract Progress Schedule of Record by a delay or an extra work order, has on the Contract Progress Schedule of Record's critical path, Contract Milestones and/or Contract Completion Date. TEAs shall be used to determine the schedule impact of extra work orders. A TEA may also be referred to as a Proposal Schedule, a Time Impact Analysis or a Time Impact Evaluation.

TEAs shall incorporate all proposed activities and logic ties required to implement the extra work order or other schedule impacts as well as detailing all impacts on existing activities, logic ties, the critical path, Contract Milestones, and the Contract Completion Date. In addition, TEAs shall accurately reflect any changes made to activities, logic ties, and restraints necessitated by the extra work order for the completion of the remaining work.

Any TEA prepared for the purpose of requesting a time extension shall clearly indicate any proposed overtime hours or additional shifts that are proposed to be incorporated in the schedule.

The Engineer shall have final discretion over the use of overtime hours and additional shifts and shall have the right to require that overtime hours and/or additional shifts be used to minimize the duration of time extensions if it is determined to be in best interest of the Department to do so.

TEAs shall be prepared and submitted in accordance with the requirements of Subsections 8.02.E.1 and 8.02.E.2 and shall be based on the Contract Progress Schedule of Record for the time the delay starts.

TEAs shall be submitted as part of an extra work order submission, a request for a time extension or within fourteen (14) Calendar Days after a request for a TEA by the Engineer.

When accepted, the changes included in a TEA shall be incorporated into a Revised Contract Progress Schedule per the requirements of Subsection 8.02.E.4 and resubmitted to the Engineer.

Failure to submit a TEA within fourteen (14) Calendar Days of a request from the Engineer could result in withholding of full or partial Contract pay estimate payments by the Engineer.

9. Recovery Schedules

The Contractor shall promptly report to the Engineer all schedule delays during the prosecution of the Work.

In addition, a Recovery Schedule shall be required whenever the Critical Path of the Contract Progress Schedule of Record exceeds the greater of:

- a.) A delay of twenty (20) Calendar Days, or
- b.) A delay equal to 5% of the Calendar Days remaining until the Contract Completion Date due to any of the three situations listed below:

1. If the contractor is behind schedule due to the fault of the contractor.
2. If the contractor anticipates becoming behind schedule due to the fault of the contractor.
3. When the delay is not the fault of the Contractor and the Department chooses to recover the lost time and requests a proposal to achieve that.

Recovery Schedules shall be prepared and submitted in accordance with Subsections 8.02.E.1 and 8.02.E.2 within fourteen (14) Calendar Days of any of the cases listed above.

Failure to submit a Recovery Schedule when and as required could result in withholding of full or partial pay estimate payments by the Engineer.

10. Disputes

All schedules shall be submitted, reviewed, dispositioned, and accepted in the timely manner specified in Subsection 8.02.C so as to provide the greatest possible benefit to the execution of this Contract.

Any dispute concerning the acceptance of a schedule or any other question of fact arising under this subsection shall be determined by the Engineer.

Pending resolution of any dispute, the last schedule accepted by the Engineer will remain as the Contract Schedule of Record as described in Subsections 8.02.E.3-5.

Basis of Payment

11 All required schedule-related work, including, but not limited to, computer, computer software, training, schedule preparation, and schedule submittals will be paid for under Pay Item 100. as defined below.

12 Failure to submit schedules within the time periods stated elsewhere in this subsection could result in the withholding of full or partial pay estimate payments by the Engineer.

13 A fixed price of \$14,000 will be provided to the Contractor for the Project Schedule Submittal requirements contained herein. The Contractor is advised that this "fixed price" value is separated from what the Department considers to be the Contractor's general condition costs for payment purposes only. If the Contractor deems it necessary to include additional costs to provide all of the requirements of this section, these additional costs shall be included in the Contractor's general conditions. The fixed price payment item shall be earned as a fixed amount set by the Department at the time of the bid. Each bidder shall include this fixed price bid item value in the total bid value. Failure to do so will be grounds for the rejection of the bid.

14 Twenty percent (20%) of this pay item will be paid upon receipt by the Engineer of the Contractor's Baseline Schedule, prepared and submitted in accordance with Subsection 8.02.E.3.

15 The remaining eighty percent (80%) of this pay item will be paid in equal monthly installments distributed across the time remaining until the time that the payment occurring immediately after Substantial Completion has been made. This calculation will be subject to revision should Substantial Completion be delayed beyond the original calculation date.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Measurement and payment for this Item will be based on the contract unit price per Lump Sum (LS).

ITEM 115.1.**DEMOLITION OF BRIDGE NO. A-10-015****LUMP SUM**

The work to be done under this Item shall conform to the relevant provisions of Section 112, 120, and 140 of the Standard Specifications, amended and or supplemented as follows:

The work to be done under this Item shall consist of the removal and satisfactory disposal of the existing superstructure and portions of the existing substructure as designated on the plans.

Existing materials to be removed and disposed of under this Item include, but are not limited to, the following:

- I. The existing stone masonry and concrete abutments and wingwalls to the limits shown
- J. The existing fill material and pavement on the bridge, including any abandoned utilities or trolley tracks and rails
- K. The existing concrete slabs, granite slabs, and steel beams
- L. The existing bridge railings
- M. Steel road plates embedded in pavement over bridge

The existing steel roadway plates shall be removed and stacked on site under this item for pick up by Town Department of Public Works.

Within 10 working days of the notice to proceed, the Contractor shall submit a plan indicating his proposed demolition procedures and methods to be used including equipment, tools, devices, crane or excavator capacity and location, schedule of operations, methods of utility protection, etc., to the Engineer for approval. The requirements for equipment and all procedures utilized shall be in conformance with the intent of Subsection 960.61 Erection of the Specifications.

The demolition procedures and any necessary calculations and drawings shall be stamped by a Professional Engineer registered in Massachusetts certifying that all existing structural members are suitably supported throughout the demolition process. In determining the stresses to which the structure will be subjected, all loading combinations including traffic and the Contractor's equipment shall be considered. The method of determining stresses shall conform to the latest AASHTO Standard Specifications for Highway Bridges. Work under this Item may not commence until the Engineer has given written approval. The demolition procedure submittal shall also include the proposed Temporary Support of Excavation submittal as required under Item 950.5.

No debris, tools or incidental equipment of any kind will be permitted to fall into areas within the vicinity of the waterway under. Any material that accidentally falls into such areas shall be removed immediately.

Prior to the start of work, the Contractor shall locate all utilities and shall submit to the Engineer and the utility companies his proposed method of protecting them during the demolition operations as part of the Demolition Procedure. Procedure approval shall not serve to relieve the Contractor of his responsibility to protect all utilities from damage at all times. Any damage resulting from Contractor Operations shall be repaired at his expense.

All materials removed under Item 115.11 unless otherwise indicated, shall become the property of the Contractor and shall be removed from the job site and disposed of properly.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Unless otherwise covered under other contract items, full payment for this work shall be included under

the lump sum price for Item 115.1, Demolition of Bridge No. A-10-015, and shall include all labor, equipment and materials necessary to complete the work.

Measurement and payment for this Item will be based on the contract unit price per Lump Sum (LS).

ITEM 120.**EARTH EXCAVATION****CUBIC YARD**

Work under this item shall conform to the relevant provisions of Sections 120, 140 and 150 of the Specifications and the following:

This work shall consist of excavation or disposal of all materials not being removed under some other item which is encountered within the limits of the Contract in accordance with the specifications and in close conformity with the lines, grades, thicknesses and cross sections shown on the plans or established by the Engineer and shall be classified as "Earth Excavation," as hereafter described or otherwise specified in separate sections. Earth Excavation shall consist of all excavation except for any excavation which is otherwise classified and paid for.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Measurement shall be made to the nearest 0.1 cubic yards of Earth Excavation complete and accepted by the Engineer. Item 120. will be paid for at the contract unit price per cubic yard and shall be considered full compensation for all labor, equipment, stockpiling, hauling, disposal, and incidentals necessary to complete the work.

Measurement and payment for this Item will be based on the contract unit price per Cubic Yard (CY).

ITEM 140.**BRIDGE EXCAVATION****CUBIC YARD**

Work under this item shall conform to the relevant provisions of Sections 120, 140 and 150 of the Specifications and the following:

Excavation shall be as required to install the proposed bridge to the lines and grades shown on the Plans. Any materials encountered shall be excavated under this item. This includes existing pavement, existing trolley tracks or rails, existing concrete or rubble, and other material encountered within the excavation limits shown on the plans.

Any necessary temporary support of excavation shall be considered incidental to this item and shall be designed and stamped by a Professional Engineer registered in Massachusetts and submitted for approval.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Measurement shall be made to the nearest 0.1 cubic yards of Bridge Excavation complete and accepted by the Engineer. Item 140. will be paid for at the contract unit price per cubic yard and shall be considered full compensation for all labor, equipment, stockpiling, hauling, disposal, and incidentals necessary to complete the work.

Measurement and payment for this Item will be based on the contract unit price per Cubic Yard (CY).

ITEM 141.**CLASS A TRENCH EXCAVATION****CUBIC YARD**

Work under this item shall conform to the relevant provisions of Sections 120, 140 and 150 of the Specifications and the following:

Class A Trench Excavation shall include the removal and satisfactory disposal of all materials, except Class B Rock Excavation that are encountered in the construction or demolition of the Bridge, Abutments, including other incidental items including headwalls, drain structures, sanitary structures, masonry walls, or test pits and whereas shall be in close conformity with the lines and grades indicated on the plans.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Measurement shall be made to the nearest 0.1 cubic yards of Bridge Excavation complete and accepted by the Engineer. Item 141. will be paid for at the contract unit price per cubic yard and shall be considered full compensation for all labor, equipment, stockpiling, hauling, disposal, and incidentals necessary to complete the work.

Measurement and payment for this Item will be based on the contract unit price per Cubic Yard (CY).

ITEM 142.**CLASS B TRENCH EXCAVATION****CUBIC YARD****GENERAL**

Work under this item shall conform to the relevant provisions of Sections 120, 140 and 150 of the Specifications and the following:

Class B Trench Excavation shall be used for the excavation, and satisfactory disposal of all materials, except Class B Rock Excavation, encountered in the construction of drainage and water pipes greater than the 5-ft maximum depth specified in Section 200: Drainage.

Trench excavation for pipe laying in roadway cuts shall include only that portion of the trench which is below the roadway excavation except where the Engineer orders in writing, and where as conforms closely with the lines and grades indicated on the plans and specifications. Trench excavation and its backfill shall be completed before the roadway excavation is begun.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Measurement shall be made to the nearest 0.1 cubic yards of Bridge Excavation complete and accepted by the Engineer. Item 142. will be paid for at the contract unit price per cubic yard and shall be considered full compensation for all labor, equipment, stockpiling, hauling, disposal, and incidentals necessary to complete the work.

Measurement and payment for this Item will be based on the contract unit price per Cubic Yard (CY).

ITEM 144.**CLASS B ROCK EXCAVATION****CUBIC YARD**

Work under this item shall conform to the relevant provisions of Section 140 of the MassDOT Standard Specifications amended as follows:

Subsection 140.25 - Class B Rock Excavation

Class B rock shall include existing walls of brick, cement concrete (reinforced or non-reinforced), granite, or stone and all solid rock that require blasting or breaking by power tools (such as jackhammers, etc.) prior to removal.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Class B Rock Excavation will be measured per Subsection 140.80 of the MassDOT Standard Specifications.

Class B Rock Excavation will be paid for per Subsection 140.81 of the MassDOT Standard Specifications.

Measurement and payment for this Item will be based on the contract unit price per Cubic Yard (CY).

ITEM 151.**GRAVEL BORROW****CUBIC YARD**

Work under this item shall conform to the relevant provisions of Sections 120, 140 and 150 of the Standard Specifications and the following:

Gravel borrow conforming to material specification M1.03.0 Type b shall be used for the roadway subbase and for backfilling behind the proposed abutment and wingwalls and in close conformity with the lines and grades indicated on the plans and specifications.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Measurement shall be made to the nearest 0.1 cubic yards of Gravel Borrow furnished and placed. Item 151. will be paid for at the contract unit price per cubic yard and shall be considered full compensation for all labor, delivery, equipment, stockpiling, hauling, disposal, and incidental work necessary to complete the work in accordance with the Plans, Specifications, and other terms of the Contract, and as complete and accepted by the Engineer. Payment for this item includes all direct and indirect costs and expenses necessary to complete the work.

Measurement and payment for this Item will be based on completed and in place at the contract unit price per Cubic Yard (CY).

ITEM 151.1**GRAVEL BORROW FOR BRIDGE FOUNDATION****CUBIC YARD**

Work under this item shall conform to the relevant provisions of Sections 120, 140 and 150 of the Standard Specifications and the following:

Gravel Borrow For Bridge Foundation shall be placed and compacted 2'-0" higher than the bottom of footing. Gravel borrow conforming to material specification M1.03.0 Type a shall be used for the backfilling behind the proposed abutment and wingwalls. Placement shall be in close conformity with the lines and grades indicated on the plans and specifications.

Excavation from the top of GRAVEL BORROW FOR BRIDGE FOUNDATION to the bottom of the footing shall be classified as BRIDGE EXCAVATION.

There shall be no swelling of quantities for GRAVEL BORROW FOR BRIDGE FOUNDATION.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Measurement shall be made to the nearest 0.1 cubic yards of Gravel Borrow for Bridge Foundations furnished and placed. Item 151.1 will be paid for at the contract unit price per cubic yard and shall be considered full compensation for all labor, delivery, equipment, stockpiling, hauling, disposal, and incidental work necessary to complete the work in accordance with the Plans, Specifications, and other terms of the Contract, and as complete and accepted by the Engineer. Payment for this item includes all direct and indirect costs and expenses necessary to complete the work.

Measurement and payment for this Item will be based on completed and in place at the contract unit price per Cubic Yard (CY).

ITEM 156.**CRUSHED STONE****TON**

Work under this item shall conform to the relevant provisions of Section 150 of the Standard Specifications and the following:

Crushed stone shall be furnished and placed in accordance with and in close conformity with the lines and grades indicated on the plans, specifications, and details.

In no case shall crushed stone be placed on other than firm material.

The minimum total depth of crushed stone to be placed under this item of work shall be 6 inches. Compaction is required for depth up to 6 in., the crushed stone shall be placed and compacted in layers not to exceed 6 in. Compaction will be accomplished by means of mechanical or pneumatic tampers. Compaction effects shall continue until the stones are firmly interlocked and the surface is unyielding.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Crushed stone will be measured by the ton to the limits of crushed stone shown on the plans. All crushed stone placed beyond the limits shown on the plans shall be considered for the Contactor's convenience and shall not be included for payment.

Measurement and payment for this Item will be based on completed and in place at the contract unit price per Ton (TON).

ITEM 170	FINE GRADING AND COMPACTING SUBGRADE AREA	SQUARE YARD
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Work under this item must conform to the relevant provisions of Section 170 of the Standard Specifications and the following:

Work under this item will include the removal and disposal of excess gravel needed to meet the lines and grades of the plans, as well as the placement, grading and compaction of gravel needed to meet the lines and grades indicated on the plans and specifications.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Measurement and payment for this Item will be based on the contract unit price of per Square Yard (SY).

<u>ITEM 201.</u>	<u>CATCH BASIN – MUNICIPAL STANDARD</u>	<u>EACH</u>
<u>ITEM 202.</u>	<u>MANHOLE – MUNICIPAL STANDARD</u>	<u>EACH</u>
<u>ITEM 204.</u>	<u>SPECIAL GUTTER INLET – MUNICIPAL STANDARD</u>	<u>EACH</u>

The work under these items shall conform to the relevant provisions of Section 201 of the Standard Specifications for Highways and Bridges and the following:

All excavation for the structures shall be included in the cost of these items. Units shall be precast concrete and shall conform to M4.02.16. Structures shall have a capability of supporting HS 20- 44 live load.

Catch basin structures shall be constructed with 4-foot sumps and include hoods. Hoods shall be provided on all catch basins.

All structures within this section shall be constructed on a bedding of 12 inches of crushed stone. No additional payment for placing crushed stone beyond these limits will be allowed unless approved in advance by the Engineer.

Catch Basins

Precast Catch Basins shall conform to ASTM C478 and AASHTO M 199, or latest revision thereto. The ends of the pipe shall be left flush with the wall of the structure and covered with $\frac{1}{4}$ - inch mesh galvanized wire screen 23 gauge satisfactorily fastened against wall. The drain weep hole shall be excavated and backfilled with 2 cubic feet of $1\frac{1}{2}$ -inch washed stone.

Live load design shall be H-20 loading. Catch basins which are limited by height shall be installed with a flat top slab, cast in place, designed for H-20 loading and cast iron frame cast in place.

Manholes

Precast Manholes shall be constructed of reinforced precast concrete monolithic base section, barrel section and dome section meeting the latest applicable requirements of ASTM C478 I and AASHTO M199, or latest revision thereto. Special manholes shall also meet the requirements of MassDOT Standard Specifications, section M4.02.14, Precast Units. After curing a minimum of 14 days, the outside surface of the tapered or cone section of precast cement concrete drainage structures shall be dried and cleaned.

Tongue and groove sections between barrel sections shall be mortared and use butyl rubber sealants. Live load design shall be H-20 loading. A 24-inch opening will be cast in the top section to accept a cast iron frame and cover. Inside diameter shall be a minimum of 4 feet unless otherwise shown on the plans and/or approved by the Engineer and the Town due to utility conflicts.

When ground water is encountered in manholes, $\frac{3}{4}$ -inch to 1-inch washed stone shall be placed distance of at least half-way up the barrel of the highest pipe.

Gutter Inlet

Precast special gutter inlets shall conform to the detail shown on the plan.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 201., Item 202., and Item 204. will be measured for at the Contract unit prices per Each (EA), regardless of depth, complete in place.

Item 201., Item 202., and Item 204. will be paid for, completed and in-place at the respective Contract unit prices per Each (EA), which price shall include all labor, materials, equipment, excavation, gravel base foundation, concrete collars, and all incidental costs required to complete the work.

Frames and Covers and Frames and Grates will be paid for separately under Item 221. and Item 222.1.

Crushed stone will be paid for separately under Item 156.

<u>ITEM 221.</u>	<u>FRAME AND GRATE (OR COVER) MUNICIPAL STANDARD</u>	<u>EACH</u>
<u>ITEM 222.1</u>	<u>FRAME AND GRATE (OR COVER) MASSDOT CASCADE TYPE</u>	<u>EACH</u>

The work under these Items shall conform to the relevant provisions of Section 201 of the Standard Specifications for Highways and Bridges and Specifications and the following:

Cast Iron shall meet requirements of ASTM A888 "Grey Cast Iron, Cast Iron Class 20." All castings shall be clean and without blow holes, sand holes or defects of any kind. Cast iron frames and covers shall be clean of all rust, dirt, and scale, and while free and clean shall be given a full coat of coal tar pitch varnish applied hot.

Frames shall be set upon a full bed of mortar, and mortar shall be brought up alongside of frame to provide a water-tight joint.

Manhole frames and covers shall be at least Class 25 conforming to ASTM A48 "Standard Specification for Gray Iron Castings." Manhole frame shall have a clear opening of 24 inches and be a minimum of 8 inches in height. The surface of the cover shall have a diamond pattern with the words "DRAIN" cast thereon for drainage manholes, as manufactured by East Jordan Iron Works (formerly LeBaron Foundry Co.) (EJIW) 2110Z/2111A, or equal.

Catch basin and drop inlet grates shall be 24-inch square grate, East Jordan Iron Works (formerly LeBaron Foundry Co. LF248-2-4F). Single catch basin grate shall consist of a 24-inch square grate (LeBaron Foundry Co. L24SG1-000) or approved equal. All frames shall have an 8-inch heavy duty frame EJWI product number 44530110.

All frames and grates or cover shall conform to the Town standards. All covers shall be manufactured with the word "DRAIN" or "SEWER" cast directly into the cover to match the corresponding utility.

The Contractor shall only reset existing castings that have been approved by the Engineer for re-use. All unsuitable castings shall be legally disposed of off-site.

The work shall consist of removing and discarding existing frames and grates (or covers) not required for reuse on this project. Said items shall become the property of the Contractor and shall be removed from the project and disposed of legally.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 221. and 222.1 will be measured for payment by the Each (EA) frame and grate (or cover) municipal standard. Frame and Grate or Frame and Cover shall be considered as a one unit.

Item 221. and 222.1, will be paid for at the Contract unit price per Each (EA), which price shall include all labor, materials, equipment, loading, unloading, storage, transportation, and all incidental costs required to complete the work.

Unsuitable frames, grates, or covers removed and discarded will be considered incidental under Item

ITEM 224.12**12 INCH HOOD****EACH**

The work under this Item shall conform to the relevant provisions of Section 220 of the Standard Specifications for Highways and Bridges and Specifications and the following:

The work shall also include the furnishing and installation of new hoods on proposed catch basins with sumps and replacing broken hoods in existing catch basins as directed.

Catch basin hoods shall protrude no more than 12 inches beyond the end of pipe into the structure.

The hood shall be manufactured by East Jordan Iron Works Item 00590261B02 or equal approved by the Town.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 224.12 will be measured for payment by the Each (EA) hood installed, complete in place.

Item 224.12 will be paid for at the Contract unit price per Each (EA), which price shall include all labor, materials, 12" hood, equipment, and all incidental costs required to complete the work.

No separate payment will be made for removal of existing traps and hoods from catch basins to remain, but all costs in connection therewith shall be included in the Contract unit price bid.

<u>ITEM 302.06</u>	<u>6 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET)</u>	<u>FOOT</u>
<u>ITEM 302.08</u>	<u>8 INCH DUCTILE IRON WATER PIPE (RUBBER GASKET)</u>	<u>FOOT</u>
<u>ITEM 303.08</u>	<u>8 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT)</u>	<u>FOOT</u>
<u>ITEM 309.</u>	<u>DUCTILE IRON FITTINGS FOR WATER PIPE</u>	<u>POUND (LB)</u>
<u>ITEM 345.6</u>	<u>6 INCH TEMPORARY SERVICE PIPE</u>	<u>FOOT</u>
<u>ITEM 350.06</u>	<u>6 INCH GATE VALVE AND BOX</u>	<u>EACH</u>
<u>ITEM 350.08</u>	<u>8 INCH GATE VALVE AND BOX</u>	<u>EACH</u>
<u>ITEM 373.08</u>	<u>8 INCH WATER PIPE INSULATION</u>	<u>FOOT</u>
<u>ITEM 376.</u>	<u>HYDRANT</u>	<u>EACH</u>

The work under these items shall conform to the relevant provisions of Section 300 of the Standard Specifications, and all applicable Town of Arlington, Department of Public Works, Water and Sewer Division Standards and the following:

The work shall include updates to the existing water lines as shown on the plans. The work shall also include the furnishing and installation of all materials required to adjust existing water gate boxes and curb stops in the event the existing infrastructure is found to conflict with proposed construction.

The Contractor shall furnish all necessary labor, tools, joint materials, equipment, etc. to connect new water pipes to existing water pipes with the required proper fittings. Flexible transition couplings used to connect new water pipes to existing water pipes shall be as specified. All connections shall be made at such time and in such a manner as to cause as little interruption in water service as possible. Coordination of all such work shall be made with the Engineer, Arlington Fire Department and the Department of Public Works; Water Division who shall be present when the work is done and shall operate all valves.

Prior written notice of at least 72 hours shall be given by the Contractor to affected Municipal Water and Fire Departments, with a copy of such notice submitted to the Engineer, before any water main is shut off and in no case shall a gate or hydrant be opened or shut without proper authorization. Upon approval by the Municipal Water and Fire Departments to schedule a water main shut down, the contractor shall provide appropriate written notice to any buildings that will be affected by said shutdown a minimum of 48 hours prior to the commencement of work.

Gates and gate boxes shall be installed in accordance with the Standard Specifications and the following:

Gates and service valves shall be "Open to the Right" per Owner's requirements.

Hydrants shall be installed in accordance with the Standard Specifications and the following:

New Hydrants shall be Waterous Traffic Flow Model WB-67-250. "Open to the Right" per Owner's requirements.

APPROVAL OF MATERIALS

The Contractor shall provide submittals including names of the material suppliers, shop drawings and certificates of compliance to the Engineer and the Town of Arlington Department of Public Works; Water Division for approval prior to ordering any materials.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

No separate payment will be made for excavation, dewatering, gravel borrow and crushed stone bedding and backfill, insulation, sampling, flushing, testing and disinfection, but all costs in connection therewith shall be included in the unit prices bid for the respective items.

Item 302.06, Item 302.08, Item 303.08 and Item 345.6 will be measured and paid for at the Contract unit price per Foot (FT), which price shall include all labor, material, equipment and incidental costs required to complete the work.

Item 309., will be measured and paid for at the Contract unit price per Pound (LB), which price shall include all labor, material, equipment and incidental costs required to complete the work.

Item 350.06, Item 350.08 and Item 376 will be measured and paid for at the respective Contract unit price per Each (EA), which price shall include all labor, material, equipment and incidental costs required to complete the work.

ITEM 402

DENSE GRADED CRUSHED STONE FOR SUB-BASE

TON

Work under this item shall conform to the relevant provisions of Section 402 of the MassDOT Standard Specifications and the following:

402.20: General

Dense Graded Crushed Stone for Sub-base consist of crusher-run coarse aggregates of crushed stone or gravel and fine aggregates of natural sand or stone screenings uniformly pre-mixed and placed on the sub-grade or sub-base in close conformity with the lines and grades shown on the plans or established by the Engineer.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Dense Graded Crushed Stone shall be measured by the ton (TON), complete-in-place and approved by the Engineer. The quantity shall be determined only by weight slips that have been properly counter signed by the inspector at the time of delivery.

Dense Graded Crushed Stone will be paid for at the contract unit price per Ton (TON) which price shall constitute full compensation for furnishing all labor, including handwork, tools, equipment, materials, supplies, transportation, installation, and all other incidentals necessary to complete the work.

ITEM 415.1**PAVEMENT STANDARD MILLING****SQUARE YARD**

The work under this item shall conform to the relevant provisions of Subsection 415 Pavement Milling within Section 400 of the Standard Specifications and the following:

This work shall consist of milling and removal of existing Hot Mix Asphalt (HMA) pavement courses from the project by the Contractor. Milling shall be performed in conformity with the approved QC Plan. The Contractor shall present and discuss in sufficient detail the Quality Control information and activities related to milling at the Construction Quality Meeting required under Section 450. Unless otherwise specified, the milled material shall become the property of the Contractor.

Milling Equipment Requirements

The milling equipment shall be self-propelled with sufficient power, traction, and stability to remove the existing HMA pavement to the specified depth and cross-slope. The milling machine shall be capable of operating at a minimum speed of 10 feet per minute, designed so that the operator can at all times observe the milling operation without leaving the control area of the machine, and equipped with the following:

- a) A built in automatic grade control system that can control the longitudinal profile and the transverse cross-slope to produce the specified results.
- b) Longitudinal controls capable of operating from any longitudinal grade reference, including string line, 30 foot ski minimum, 30 foot mobile string line minimum, or a matching shoe.
- c) The transverse controls shall have an automatic system for controlling cross-slope at a given rate.
- d) Cutting heads able to provide a minimum 6 foot cutting width and a 0 to 4 inch (0 to 100 mm) deep cut in one pass. The teeth on the revolving cutting drum must be continually maintained and shall be replaced as warranted to provide a uniform pavement texture.
- e) An integral pickup and conveying device to immediately remove milled material from the roadway and discharge the millings into a truck, all in one operation.
- f) All necessary safety devices such as reflectors, headlights, taillights, flashing lights and back up signals so as to operate safely in both day and night.
- g) A means of effectively limiting the amount of dust escaping from the milling and removal operation in accordance with local, State, and Federal air pollution control laws and regulations.

When milling smaller areas or areas where it is impractical to use the above described equipment, the use of a smaller or lesser-equipped milling machine may be permitted when approved by the Engineer.

Sweeper Equipment Requirements

The Contractor shall provide a sufficient number of mechanical sweepers to ensure that the milled surface is free of millings and debris at the end of each day's milling operations. Each sweeper shall be equipped with a water tank, spray assembly to control dust, a pick-up broom, a dual gutter broom, and a dirt hopper. The sweepers shall be capable of removing millings and loose debris from the textured pavement.

Milling Operations

The milling operations shall be scheduled to minimize the duration and placement of traffic on the milled surface. The milling operations shall not proceed more than 3 miles ahead of the paving operations. Under no circumstances shall the milled surface be left exposed to traffic for a period exceeding seven days. The Engineer may allow the Contractor to adjust the above limitations on milling production when necessary.

The Contractor shall coordinate milling and paving operations to minimize the exposure of milled surfaces to traffic. The Contractor shall ensure that milled surfaces are overlaid in a timely manner to avoid damage to the pavement structure. Any damage to the pavement structure resulting from extended exposure of the milled surface to traffic shall be repaired as directed by the Engineer at the Contractor's expense.

The existing pavement shall be removed to the average depth shown on the plans, in a manner that will restore the pavement surface to a uniform cross-section and longitudinal profile. The longitudinal profile of the milled surface shall be established using a 30 foot mobile ski, mobile string line, or stationary string line. The cross-slope of the milled surface shall be established by a second sensing device or by an automatic cross-slope control mechanism. The Contractor will be responsible for providing all grades necessary to remove the material to the proper line, grade, cross section, superelevation, and transitions shown on the plans or as directed by the Engineer. The requirement for automatic grade or slope controls may be waived by the Engineer in locations warranted by the situation, including intersections and closely confined areas.

The Engineer may adjust the average milling depth specified on the plans by $\pm 3/4"$ ($\pm 20\text{mm}$) during each milling pass at no additional payment to minimize delamination of the underlying pavement course or to otherwise provide a more stable surface. If delamination or exposure of concrete occurs when milling a HMA pavement course from an underlying Portland Cement Concrete (PCC) pavement, the Contractor shall cease milling operations and consult the Engineer to determine whether to reduce the milling depth or make other adjustments to the operation.

Protection of Inlets and Utilities

Throughout the milling operation, protection shall be provided around existing catch basin inlets, manholes, utility valve boxes, and any similar structures. Any damage to such structures as a result of the milling operation is the Contractor's responsibility and shall be repaired at the Contractor's expense. To prevent the infiltration of milled material into the storm sewer system the Contractor shall take special care to prevent the milled material from falling into the inlet openings or inlet grates. Any milled material that falls into inlet openings or inlet grates shall be removed at the Contractor's expense.

Vertical Faces

All permanent limits of the milled area shall be sawcut or otherwise neatly cut by mechanical means to provide a clean and sound vertical face. No vertical faces, transverse or longitudinal, shall be left exposed to traffic. If any vertical face is formed in an area exposed to traffic a temporary paved transition with a maximum 12:1 slope shall be established. If the milling machine is used to temporarily transition the milled pavement surface to the existing pavement surface, the temporary transition shall be constructed at a maximum 12:1 slope.

Opening to Traffic

Prior to opening a milled area to traffic, the milled surface shall be thoroughly swept with a mechanical sweeper to remove all remaining millings and dust. This operation shall be conducted in a

manner so as to minimize the potential for creation of a traffic hazard and to comply with local, State, and Federal air pollution control laws and regulations. Any damage to vehicular traffic as a result of milled material becoming airborne is the responsibility of the Contractor and shall be repaired at the Contractor's expense. Temporary pavement markings shall be placed in accordance with the provisions of Subsection 850.64.

Milled Surface Inspection

The milled surface shall provide a satisfactory riding surface with a uniform textured appearance. The milled surface shall be free from gouges, excessive longitudinal grooves and ridges, oil film, and other imperfections that are a result of defective equipment, non-uniform milling teeth, improper use of equipment, or otherwise poor workmanship. Any unsatisfactory surfaces produced shall be corrected by remilling at the Contractor's expense and to the satisfaction of the Engineer.

The Contractor shall perform Quality Control inspection of all work items addressed as specified in the table below. Inspection activities during milling of HMA pavement may be performed by qualified Production personnel (e.g. Skilled Laborers, Foremen, Superintendents). However, the Contractor's QC personnel shall have overall responsibility for QC inspection. The Contractor shall not rely on the results of Department Acceptance inspection for Quality Control purposes. The Engineer shall be provided the opportunity to monitor and witness all QC inspection.

Minimum QC Inspection of Milling Operations

Inspection Component	Items Inspected	Minimum Inspection Frequency	Point of Inspection	Inspection Method
Equipment	As specified in QC Plan	Per QC Plan	Per QC Plan	Per QC Plan
Environmental Conditions	Protection of Inlets & Utilities	Per QC Plan	Existing Surface	Visual Check
	Removal of Millings & Dust	Per QC Plan	Milled Surface	Visual Check
Workmanship	Milling Depth	Per QC Plan	Milled Surface	Check Measurement
	Cross-Slope & Profile	Per QC Plan	Milled Surface	Check Measurement
	Milled Surface Texture	Per QC Plan	Milled Surface	Visual Check

	Milled Surface Roughness	Once per 500 feet per milled lane	Milled Surface per Subsection 410.67	10 foot standard straightedge
	Sawcut Limit Vertical Face	Per QC Plan	Sawcut Limits	Visual Check

The Contractor shall perform a minimum of one random QC measurement with a 10 foot straightedge in the transverse direction across the milled surface. All QC inspection results shall be recorded on NETTCP Inspection Report Forms. The Contractor shall perform surface texture measurements with a 10 foot straightedge in the transverse direction across the milled surface. The milled surface shall have a texture such that the variation from the edge of the straightedge to the top of ridges between any two ridge contact points shall not exceed 1/8 inch (3 mm). The difference in height from the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed 1/16". Any point in the surface not meeting these requirements shall be corrected as directed by the Engineer at the Contractor's expense.

In isolated areas where surface delamination between existing HMA layers or a surface delamination of HMA on Portland Cement Concrete causes a non-uniform texture to occur, the straightedge surface measurement requirements stated in the preceding paragraph may be waived, subject to the approval of the Engineer.

Milling Equipment Requirements

The milling machine shall be equipped with a drum specifically designed to provide the surface specified below.

The milled surface shall provide a satisfactory riding surface with a uniform textured appearance. The milled surface shall be free from gouges, excessive longitudinal grooves and ridges, oil film, and other imperfections that are a result of defective equipment, non- uniform milling teeth, improper use of equipment, or otherwise poor workmanship. Any unsatisfactory surfaces produced shall be corrected by additional milling at the Contractor's expense and to the satisfaction of the Engineer.

The milled pavement surface shall have a transverse pattern of 0.2 – 0.3 inch center to center of each strike area. The Contractor shall perform surface texture measurements with a 10 foot straightedge in the transverse direction across the milled surface. The milled surface shall have a texture such that the variation from the edge of the straightedge to the top of ridges between any two ridge contact points shall not exceed 1/8 inch. The difference in height from the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed 1/16". Any point in the surface not meeting these requirements shall be corrected as directed by the Engineer at the Contractor's expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

All pavement milling will be measured for payment by the number of square yards of area from which the milling of existing HMA pavement has been completed and the work accepted. No area deductions will be made for minor un-milled areas such as catch basin inlets, manholes, utility boxes and any similar utility structures.

All pavement milling of existing HMA pavement will be paid for at the contract unit price per square yard. This price shall include all QC activity related to the milling operation, all equipment, tools, labor, incidental materials, and removal and disposal of milled material. No additional payments will be made for multiple passes with the milling machine to remove the existing HMA surface to the grade specified.

No separate payments will be made for: performing handwork removal of existing pavement and providing protection around catch basin inlets, manholes, utility valve boxes and any similar structures; repairing surface defects as a result of the Contractor's negligence; providing protection to underground utilities from the vibration of the milling operation; sawcutting milled limits; installing and removing any temporary transition; removing and disposing of millings; furnishing a sweeper and sweeping after milling. The costs for these items shall be included in the contract unit price for Pay Item 415., Pavement Standard Milling at the Contract unit price per SQUARE YARD (SY),

ITEM 440. **CALCIUM CHLORIDE FOR ROADWAY DUST CONTROL** **pound (LB)**

This work shall consist of furnishing and applying calcium chloride for the alleviation or prevention of dust nuisance as directed in accordance with these Specifications.

Calcium chloride shall conform to the requirements of AASHTO M 144, Type I or Type II.

Calcium chloride shall be uniformly applied at a rate of 1½ pounds per square yard or at any other rate as directed by the Engineer, by means of mechanical spreader, or other approved methods.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Calcium Chloride for Roadway Dust Control will be measured by the pound (LB), complete in place.

Calcium Chloride for Roadway Dust Control will be paid for at the contract unit price per pound (LB) which price shall constitute full compensation for all labor, tools, equipment and materials necessary to complete the work.

ITEM 443.**WATER FOR ROADWAY DUST CONTROL****MGAL**

This work shall consist of furnishing and applying water for the alleviation or prevention of dust nuisance, as directed in accordance with these Specifications.

Water shall be applied only at locations and at such times and in the amount as may be directed by the Engineer. Quantities of water wasted or applied without authorization will not be paid for.

Watering equipment shall consist of pipelines, tanks, tank trucks or other devices, approved by the Engineer, which are capable of applying a uniform spread of water over the surface. A suitable device for a positive shut-off and for regulating the flow of water shall be located so as to permit positive operator control.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Water for Roadway Dust Control will be measured for payment by the number of thousand gallons (MGAL) applied. The water will be measured in tanks or tank trucks of predetermined capacity, or by means of satisfactorily installed meters. All measuring devices shall be furnished by the Contractor.

Water for Roadway Dust Control will be paid for at the contract unit price per thousand gallons (MGAL) which price shall include all water, labor, tools and equipment required to furnish, apply and measure the water applied to surfaces designated by the Engineer and at times specified.

<u>ITEM 451.</u>	<u>HOT MIX ASPHALT (HMA) FOR PATCHING</u>	<u>TON</u>
<u>ITEM 452.</u>	<u>ASPHALT EMULSION FOR TACK COAT</u>	<u>GAL</u>
<u>ITEM 453.</u>	<u>HOT MIX ASPHALT (HMA) JOINT ADHESIVE</u>	<u>FOOT</u>

Work under these item shall conform to the relevant provisions of Section 400 of the MassDOT Standard Specifications inclusive of Subsection 450 and as follows:

HMA for Patching shall include all sawcutting, removal of existing distressed or unsound pavement, applying hot applied pavement joint adhesive to vertical faces, applying the tack coat to all required surfaces at the specified rate in accordance with 450.43: Preparation of Underlying Surface, Part G, and transportation, delivery, placement, and compaction of HMA for Patching in accordance with 450.43: Preparation of Underlying Surface, Part C.

HMA Joint Adhesive shall be used for adhering all longitudinal joints and transverse joints in HMA pavement courses.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 453. HMA Joint Adhesive used for adhering all longitudinal joints and transverse joints in HMA pavement courses will be measured by the foot (FOOT).

Item 451. HMA for patching will be paid for at the contract unit price per ton (TON) and shall be the actual quantity complete, in place and accepted by the Engineer.

Item 452. when HMA is used the asphalt emulsion for tack coat will be paid for at the contract unit price per gallon (GAL) under Item 452. Asphalt Emulsion for Tack Coat.

Item 453. HMA Joint Adhesive will be paid for at the contract unit price per foot (FOOT) of joint sealed under Pay Item 453. Payment shall include application of the joint adhesive to all longitudinal joints and transverse joints in HMA pavement courses as required and in accordance with 450.49: Hot Mix Asphalt Joints.

<u>ITEM 460.22.</u>	<u>SUPERPAVE SURFACE COURSE - 9.5 (SSC - 9.5)</u>	<u>TON</u>
<u>ITEM 460.32.</u>	<u>SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC 19.0)</u>	<u>TON</u>
<u>ITEM 460.42.</u>	<u>SUPERPAVE BASE COURSE - 37.5 (SBC 37.5)</u>	<u>TON</u>

The work under these items shall conform to the relevant provisions of Section 450 of the Standard Specifications for Highways and Bridges and the following:

The Equivalent Single Axle Loads (ESALs) for the design travel lane over a 20-year period, is 1.8 Million 18-kip (80-kn) ESALs.

Performance grade asphalt binder used for the superpave surface course 12.5 (SSC-12.5) HMA mixture is a PG 70-28 grade V (PG70V-28). The performance grade for all superpave intermediate course 19.0 (SIC-19.0) and superpave base course 37.5 (SBC-37.5) HMA mixtures is a PG 64-28 grade S (PG64S-28).

Surface paving to be completed at the end of the project and as directed when it can be placed in its entirety.

Pavement patches (at deteriorated pavement) shall be as shown on the construction details and as directed by the Engineer.

Note: The hot mix asphalt (HMA) Drives with Superpave HMA mixtures shall be paved in accordance with Section 701 of the Standard Specification which shall be the basis for the work and paid for under Item 702. HMA Walks and Item 703. HMA Drives. The Superpave HMA for shall not be subject to QA sampling and testing.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 460.22, Item 460.32 and Item 460.42 will be measured by the ton (TON) and shall be the actual and verified tonnage, complete in place and approved. The quantity shall be determined only by weight slips that have been properly countersigned by the Engineer at the time of delivery.

Item 460.22, Item 460.32 and Item 460.42 will be paid for at the contract unit price per ton (TON), complete in place.

ITEM 472.**TEMPORARY ASPHALT PATCHING****TON**

The work under this item shall conform to the relevant provisions of Section 472 of the Standard Specifications for Highways and Bridges and the following:

The work shall include placement of hot mix asphalt for temporary pedestrian and vehicular access as well as traffic management and maintenance.

The work shall also include trench patching as shown on the Plans and requested by the Engineer.

The Contractor is advised that this material will have to be placed primarily by hand methods.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 472 will be measured by the ton (TON) and shall be the actual and verified tonnage, complete in place and approved. The quantity shall be determined only by weight slips that have been properly countersigned by the Engineer at the time of delivery.

Item 472 will be paid for at the contract unit price per ton, complete in place which includes full compensation for the satisfactory removal and disposal of temporary material at a later date and as directed by the Engineer.

ITEM 482.4**SAWCUTTING PORTLAND CEMENT CONCRETE****TON**

The work under these items shall conform to the relevant provision of Section 120 of the Standard Specifications and the following:

The work shall include the saw-cutting of existing pavements at limits of full-depth pavement and sidewalk construction, and as required by the Engineer. Saw-cut equipment shall be approved by the Engineer prior to commencing work.

All edges of excavations made for saw-cutting pavements shall be squared by saw-cutting with power-driven tools to provide a neat, clean edge for joining new pavement as shown on the Plans. Ragged, uneven edges shall not be accepted. Areas which have been broken or undermined shall be edged neatly with a minimum disturbance to remaining pavements.

Saw-cut surfaces shall be sprayed or painted with a uniform thin coat of RS-1 asphalt emulsion immediately before placement of bituminous concrete material against the surface.

Sawing Asphalt Pavement and Sawing Cement Concrete (including saw-cutting required for the installation of traffic signal conduits) includes all labor, tools, materials, equipment and incidental costs required to complete the work to the satisfaction of the Engineer.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 482.4, Sawing Cutting Cement Concrete, will be measured for payment by the foot (FOOT), complete in place.

Item 482.4, Sawing Cutting Cement Concrete, will be paid for at the contract unit price per foot (FOOT). Price shall include all labor, tools, materials, equipment and incidental costs required to complete the work to the satisfaction of the Engineer.

<u>ITEM 504.</u>	<u>GRANITE CURB TYPE VA4 - STRAIGHT</u>	<u>FOOT</u>
<u>ITEM 581.</u>	<u>GRANITE CURB INLET – REMOVED AND RESET</u>	<u>FOOT</u>

Work under these items shall conform to the relevant provisions of Sections 500 and 580 of the MassDOT Standard Specifications and the following:

MATERIALS

All curb to be set, reset, or relocated shall be placed on a crushed stone base in accordance with the plans and specifications for Item 156.12, Crushed Stone for Curb Foundation.

All granite curbing shall be in conformance with Subsection M9.04 of the MassDOT Standard Specifications and the details on the contract drawings.

CONSTRUCTION METHODS

All curb to be set, reset or relocated shall be placed on a crushed stone base in accordance with the plans and specifications for Item 156.12, Crushed Stone for Curb Foundation.

When setting, resetting, or relocating curb in an area where the existing pavement is to remain or is to be resurfaced, the Contractor shall be required to cut the existing pavement with a mechanical saw or by some other method approved by the Engineer.

The bituminous or cement concrete base shall be cut through by the compressor method. The existing pavement and base shall be cut in a straight line running parallel to and 18 inches from the final location of the curb. The Contractor will set the curb on the crushed stone foundation and backfill the roadway side of the trench with the required amount of gravel and a minimum of 4 inches of cement concrete base up to the bottom of the proposed top course of hot mix asphalt.

Curb shall be cleaned of all debris. Surfaces that are painted or dirty or discolored shall be sand-blasted prior to resetting.

Granite Curb Type VA4, either straight or curved, for low retaining wall shall be installed along the back of the sidewalk as directed by the Engineer. The Engineer may substitute a different material, such as concrete pavers, granite block etc., as required due to existing conditions. The Contractor shall excavate a sufficient area in depth and width in order to install the curb on a crushed stone base in accordance with the plans. The Contractor shall set the curb on the crushed stone foundation prior to the installation of the new sidewalk material. The Contractor shall backfill behind the granite curb to restore disturbed areas to existing conditions.

The granite curbing shall be installed in conformance with the construction drawings.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The length of curb shall be as measured along the front arris of the curb. The measurement will be made along the edging at the lowest exposed level after completion of shoulder or pavement.

Curb Removed and Reset will be measured along the arris of the curb that has been actually removed and reset.

The various types of Granite Curb will be paid for by the contract unit price per linear foot, complete in place which price shall constitute full compensation for grading, furnishing and placing all materials, labor, tools, equipment and incidentals necessary to complete the work.

Existing curb corners and granite curb will be reused when shown on the plans or as directed by the Engineer.

The cost of removing, relocating, and resetting VA4 curb, sloped curb, T-100 curb, curb inlets, and curb corners, including resetting curb corners when widening or narrowing existing driveways, will be paid for under Item 580., Curb Removed and Reset.

Crushed stone will be paid for under Item 156., Crushed Stone.

Gravel and Cement Concrete for setting and/or encasing granite curb shall be considered incidental the installation of or removal and resetting of the granite curb.

The cost of saw cutting and removing pavement and base shall be included in the prices bid for the respective curb items.

Any work requiring chamfering and/or cutting of curbing shall be incidental to the above items.

<u>ITEM 697.1</u>	<u>SILT SACK</u>	<u>EACH</u>
<u>ITEM 697.2</u>	<u>FLOATING SILT FENCE</u>	<u>FOOT</u>
<u>ITEM 767.121</u>	<u>SEDIMENTATION CONTROL BARRIER</u>	<u>FOOT</u>

The work under these items shall conform to the relevant provisions of Sections 670, 751 and 767 of the Standard Specifications and shall include the furnishing and placement of a sediment control barrier, silt sacks, turbidity curtain and debris net/tarp. Sedimentation Control Barrier shall be installed prior to disturbing upslope soil.

The purpose of these items is to capture sediment, slow runoff velocity and filter suspended sediments from storm water flow. Erosion Control barriers should be used to contain stockpile sediments, to break slope length, and to slow or prevent upgradient water or water off road surfaces from flowing into a work zone. Contractor shall be responsible for ensuring that all devices included in the above items barriers fulfill the intent of adequately controlling siltation and runoff and furthermore adhere to the Order of Conditions issued by the Arlington Conservation Commission.

Silt Sacks

The work under this item includes the furnishing, installation, maintenance and removal of a reusable fabric sack to be installed in drainage structures for the protection of wetlands and other resource areas and the prevention of silt and sediment from the construction site from entering the storm water collection system. Devices shall be ACF Environmental (800)-448-3636; Reed & Graham, Inc. Geosynthetics (888)-381-0800; The BMP Store (800)-644-9223; or approved equal.

Silt sacks shall be installed in retained existing and proposed catch basins within the project limits and as required by the Resident Engineer. The silt sack shall be as manufactured to fit the opening of the drainage structure under regular flow conditions, and shall be mounted under the grate. The insert shall be secured from the surface such that the grate can be removed without the insert discharging into the structure. The filter material shall be installed and maintained in accordance with the manufacturer's written literature and as required by the Engineer.

Silt sacks shall remain in place until the placement of the pavement overlay or top course and the graded areas have become permanently stabilized by vegetative growth. All materials used for the filter fabric will become the property of the Contractor and shall be removed from the site.

The Contractor shall inspect the condition of silt sacks after each rainstorm and during major rain events. Silt sacks shall be cleaned periodically to remove and disposed of accumulated debris as required. Silt sacks, which become damaged during construction operations, shall be repaired or replaced immediately at no additional cost to the Department.

When emptying the silt sack, the contractor shall take all due care to prevent sediment from entering the structure. Any silt or other debris found in the drainage system at the end of construction shall be removed at the Contractors expense. The silt and sediment from the silt sack shall be legally disposed of offsite. Under no condition shall silt and sediment from the insert be deposited on site and used in construction.

All curb openings shall be blocked to prevent stormwater from bypassing the device.

Material collected in silt sacks is considered solid waste and must be disposed of in accordance with the MassDOT standard specifications for Item 227.3, Removal of Drainage Structure Sediment.

Floating Silt Fence/Turbidity Curtain

The work under this Item shall include installation, maintenance and removal of a temporary floating silt fence to prevent any sediment disturbed during construction from reaching adjacent waterways and further dispersing. The fence shall be installed within the waterway, approximately 50 feet downstream of the bridge.

Floating silt fence shall be made of a woven polypropylene with a minimum 200 lb. tensile strength. The Contractor shall submit to the Engineer, for review and approval, product specifications and technical data provided by the manufacturer, prior to installation. The fence shall be continuously weighted at the bottom to maintain a vertical submerged position. Anchors shall be placed at both ends of the curtain and at intermediate locations, as necessary, to hold the fence securely in place. The fence shall be installed to withstand the forces of the flow of the waterway.

Floating silt fence/Turbidity curtain shall be installed before construction begins and earth is disturbed. Silt fences shall be inspected and approved by the Arlington Conservation Commission Agent after installation and prior to commencement of further construction activities.

The Contractor shall inspect Turbidity Curtain at least weekly to ensure continuous effectiveness, and shall be maintained for effective performance at all times. If any portion becomes damaged or dislodged, construction activities shall be halted until all deficiencies are corrected by the Contractor with no additional compensation. The floating silt fence shall be removed after all construction activities are completed and in such a way that no collected sediment is dispersed into waterways.

Sedimentation Control Barrier

The sedimentation control shall consist of a combination of a sedimentation fence and a straw wattle. The Materials and Installation shall be per Section 670.40 and 670.60 of the Standard Specifications and as the following:

Sedimentation fence shall be used as shown on the plans or when specified by Orders of Condition or other permit requirements, and shall be installed in the approximate location as shown on the plans and/or as required or directed during pre-construction meeting. Installation shall be such that no excavated or disturbed soil can enter resource areas or adjacent wetlands or waterways. If necessary to accommodate field conditions and to maximize effectiveness, barrier locations may be shifted with approval from the Engineer. Barriers shall be in place prior to excavation work. No work shall take place outside the barriers.

Prior to initial placement of barriers, the Contractor shall review the locations with the Engineer and Conservation Agent as specified on the plans and adjust placement to ensure that the placement will provide maximum effectiveness.

Barriers shall be staked, trenched, and/or wedged as specified herein and according to the Manufacturer's instructions. Barriers shall be securely in contact with existing soil such that there is no flow beneath the barrier.

Additional barrier, such as double or triple stacking of compost filter tubes, will be paid for per foot of tube installed.

Straw wattles shall be placed on a minimum of 8 inches of folded fabric on the upslope side of the fence. Fabric does not need to be trenched.

This work shall consist of the furnishing and installation of rolled twelve (12) inch diameter straw wattles, staked and in place in conjunction with the Sedimentation Fence prior in conjunction with the to any reclamation work, as indicated upon the plan set, or a directed by the Engineer.

Considered incidental to this bid item, will be the removal and disposal of the straw wattles and any staking material, by the Contractor in an offsite and legal manner, once directed by the Engineer.

Stakes shall be on the down slope side of the trench and shall be spaced such that the fence remains vertical and effective.

Width of fabric shall be sufficient to provide a 36-inch high barrier after fabric is folded or trenched. Sagging fabric will require additional staking or other anchoring.

Maintenance of the sediment control barrier shall be per Section 670.60 of the Standard Specifications or per the Order of Conditions , whichever is more restrictive.

The contractor shall inspect the sediment barrier in accordance with relevant permits. At a minimum, barriers shall be inspected at least once every 7 calendar days and after a rain event resulting in 0.25 inches or more of rainfall. Contractor shall be responsible for ensuring that an effective barrier is in place and working effectively for all phases of the Contract.

Barriers that have been driven over or otherwise damage by construction activities shall be repaired or replaced as directed by the Engineer at the Contractors expense.

Barriers that decompose such that they no longer provide the function required shall be repaired or replaced as directed. If the resulting berm of compost within the fabric tube is sufficiently intact (despite fabric decay) and continues to provide effective water and sediment control, barrier does not necessarily require replacement.

When required by permits, additional sediment barrier shall be stored on-site for emergency use and replacement for the duration of the contract.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 697.1, Silt sacks will be measured and paid at the Contract unit price per each (EA), complete in place, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for removal and disposal of the sediment from the insert, but all costs in connection therewith shall be included in the Contract unit price bid.

Item 697.2 shall be measured for payment and paid for at the Contract unit price per FOOT (FT)of floating silt fence/turbidity curtain installed. This item shall include full compensation for all labor, equipment, materials, incidentals, satisfactory removal, and maintenance of the floating silt fence throughout the duration of the Contract.

Item 767.121 shall be measured for payment and paid for at the Contract unit price per FOOT (FT) of sedimentation control barrier installed (includes sedimentation fence and straw wattle). This item shall include full compensation for all labor, equipment, materials, maintenance, dismantling, removal, disposal and restoration of soil, and all incidental costs required to complete the work.

<u>ITEM 852.</u>	<u>SAFETY SIGNING FOR TRAFFIC MANAGEMENT</u>	<u>SF</u>
<u>ITEM 853.1</u>	<u>PORTABLE BREAKAWAY BARRICADE TYPE III</u>	<u>EACH</u>
<u>ITEM 853.2</u>	<u>TEMPORARY BARRIER (TL-2)</u>	<u>FOOT</u>
<u>ITEM 853.21</u>	<u>TEMPORARY BARRIER REMOVED AND RESET</u>	<u>FOOT</u>
<u>ITEM 853.501</u>	<u>TEMPORARY IMPACT ATTENUATOR REMOVED AND RESET</u>	<u>EACH</u>
<u>ITEM 853.72</u>	<u>TEMPORARY IMPACT ATTENUATOR BI-DIRECTIONAL, NON-REDIRECTIVE REMOVED AND RESET</u>	<u>EACH</u>
<u>ITEM 854.036</u>	<u>TEMPORARY PAVEMENT MARKINGS – 6 INCH TAPE</u>	<u>FOOT</u>
<u>ITEM 854.1</u>	<u>PAVEMENT MARKING REMOVAL</u>	<u>SF</u>
<u>ITEM 859</u>	<u>REFLECTORIZED DRUM</u>	<u>EACH</u>
<u>ITEM 866.106</u>	<u>6 INCH REFLECTORIZED WHITE LINE (EPOXY)</u>	<u>FOOT</u>
<u>ITEM 867.106</u>	<u>6 INCH REFLECTORIZED YELLOW LINE (EPOXY)</u>	<u>FOOT</u>

The work to be performed under these Items shall conform to the relevant provisions of Section 800, Section 850 of the Standard Specifications and the following;

Work under this Section consists of furnishing, installing and maintaining in proper operating condition various traffic control devices for the protection of the traveling public and working personnel during construction and maintenance operations. The design, application, and installation of all devices shall conform to MassDOT's "Standard Details and Drawings for the Development of Temporary Traffic Control Plans" and the MUTCD, and/or as directed.

The Contractor shall be responsible for the installation of adequate safety precautions for the protection of the traveling public and all project personnel.

All construction vehicles not protected by any form of traffic control device on a project which is open to traffic shall have an amber flashing light mounted on the cab roof or on the highest practical point of the machinery. The light shall be in operation whenever the equipment is working on the highway or travel way. Amber flashers must be a minimum of 40 cd and have a flashing frequency of 50 to 60 times per minute. Either rotating beacons or strobe lights meeting these requirements are acceptable.

All materials provided by the Contractor under the items of this section shall remain the property of the Contractor upon completion of the project.

All work under this Section shall conform to the approved Temporary Traffic Control Plan.

SAFETY SIGNING FOR TRAFFIC MANAGEMENT

Safety Signing for Traffic Management consists of furnishing, positioning, repositioning, covering and uncovering, maintaining and removing, as needed and/or as directed: regulatory, warning, and guide signs together with their supports. If additional supports are needed due to site conditions they will be considered incidental to the work.

Signs over 50 ft² will require approval of design calculations and shop drawings of the breakaway support system if the signs are installed at an unprotected location.

Signs which are damaged or are missing from their locations shall be replaced by the Contractor without additional compensation except as described in Subsection 7.17: Traffic Accommodation.

All signs shall be maintained in a satisfactory manner including the removal of dirt or road film that causes a reduction in sign reflective efficiency.

All signs shall be mounted in compliance with the requirements of the MUTCD.

All signs not consistent with the use of the roadway shall be removed, completely covered, or turned away from traffic each day. In no case shall signs or their portable supports be left in the traveled way when the traffic management set-up has been removed.

Rollup signs shall only be used for single work shift setups.

Rigid signs shall be fabricated from plywood, aluminum or approved alternate substrate material.

Plywood sign material shall be $\frac{5}{8}$ -in. Exterior MDO – General (one sided).

Aluminum sign material shall be Type A, 0.080 in. thick, as specified in 828.42: Panels.

The entire sign face shall be retro-reflectorized. Retroreflective sheeting shall conform to M9.30.0. Rollup signs shall be fabricated from vinyl microprismatic retroreflective material.

Background sheeting for all construction warning signs shall be of a fluorescent orange color. The minimum spectral radiance factor, in accordance with Section 5.1 of ASTM E991, for the fluorescence shall be as follows:

New: 110% minimum

Weathered: 60% minimum

Materials shall conform to Sections 828 and 840 except the plywood material shall conform to the following: Plywood sign panels and independent Route Markers shall be fabricated from 5 ply 15 mm thick Medium Density Overlaid (MDO) Exterior Type, A-B both sided surface in natural color and the whole conforming with the requirements and tests for the above as set forth in US Produce Standard PSI-74 for Construction and Industrial Plywood. All plywood shall bear the grade trade mark of an approved testing agency. The entire sign face shall be reflectorized with reflective sheeting conforming to M9.30.0, Type III, or Type IV, shall be orange in color.

PORTABLE BREAKAWAY BARRIER TYPE III

Portable Breakaway Barricades Type III consists of furnishing, positioning, repositioning, maintaining and removing. Portable Breakaway Barricades Type III where indicated on the plans and/or as directed by the Engineer.

The Contractor shall furnish, set up, move and remove Portable Breakaway Barricades Type III as required or directed by the Engineer. Portable Breakaway Barricades Type III shall be maintained in a good and serviceable condition throughout the project and shall be moved from place to place as required during construction and as directed by the Engineer.

TEMPORARY BARRIER (TL-2)

TEMPORARY BARRIER REMOVED AND RESET

Temporary Barrier consists of furnishing, installing, maintaining and final removal of temporary barriers, including delineation, for traffic control or work zone protection in construction zones.

Temporary Barrier Removed and Reset consists of removing, transporting and resetting of temporary barrier units from alignments established along the roadway to new alignments as required by the construction and staged construction operations for the control of traffic or work zone protection.

The Contractor shall use a temporary barrier system that is listed on the QTCE.

The Temporary Barrier shall be installed as shown on the plans, in accordance with these provisions and/or as directed by the Engineer.

Each run of temporary barrier units shall be fastened together to form a continuous chain.

Temporary impact attenuators with delineation shall be installed at ends of barriers within 30 ft of approaching traffic. The Contractor shall not leave a barrier leading-end unprotected.

Delineators shall be installed in conformance with manufacturer's recommendations on the barriers at their termini; at 20-ft intervals on tangent sections; and 10-ft intervals on curved sections depending on radius as determined by the Engineer.

Delineators mounted on top of barriers separating opposing traffic shall have two sided amber reflectors delineating the left edge. Side mounted delineators shall have amber delineating the left edge, white delineating the right edge and have red as the back color. If mounted on the sides they shall be 6 in. below the top and on the side of traffic. Delineators shall be mounted at angles that provide maximum reflectorization.

Temporary Barriers shall be removed from existing locations and reset in accordance with above requirements, as directed by the Engineer.

TEMPORARY IMPACT ATTENUATOR REMOVED AND RESET

Work under Item 853.501 shall conform to the relevant provisions of Section 850 and shall consist of maintaining, removing and reinstalling temporary impact attenuators where indicated on the plans or as directed by the Engineer.

TEMPORARY IMPACT ATTENUATOR BI-DIRECTIONAL, NON-REDIRECTIVE

Work under Item 853.72 shall conform to the relevant provisions of Section 850 and shall consist of furnishing, installing, maintaining and final removal of temporary impact attenuator systems for protection of the ends of temporary barrier and other roadside hazards in work zones. All work shall be in conformance with the specifications of close conformance with the locations, lines, and grades shown on the plans.

The Contractor shall supply a temporary impact attenuator that meets the same or higher crash Test Level (TL) as the adjacent temporary barrier, unless otherwise shown on the plans. The temporary attenuator shall be listed on the Department's Qualified Traffic Control Equipment List.

The temporary impact attenuator shall be designed to fit within reasonably close tolerance of the dimensions given on the plans.

The Contractor shall supply shop drawings for the temporary attenuator and for any anchorage system and for any transitions or connections between the temporary attenuator and the adjacent barrier or other roadside hazard.

The side of the temporary attenuator that faces traffic shall include a Type 3 Object Marker that conforms to the language found in Sections 2C.64 and 2C.65 of the Manual on Uniform Traffic Control Devices.

Unless a separate barrier system protects it from opposing traffic, only temporary impact attenuators that are certified for bi-directional use shall be used in medians.

Installation means and methods shall be per the manufacturer's specifications and/or drawings.

Temporary Impact Attenuators Removed and Reset consists of removing temporary impact attenuators, relocating and reinstalling at a new location per the specifications and recommendations of the manufacturer and as shown on the plans or as directed by the Engineer.

Excavation for temporary attenuator foundations and anchorage shall be made to the required depth and to a width that will permit the installation and bracing of forms where necessary. All soft and unsuitable material shall be replaced with compacted gravel borrow.

TEMPORARY PAVEMENT MARKINGS - 6 INCH (TAPE)

Temporary Pavement Markings and Temporary Raised Pavement Markers consist of furnishing, applying, maintaining and removing temporary white and yellow reflectorized pavement markings and temporary raised pavement markers during construction and maintenance operations.

Temporary markings shall be effective for a period of 90 days. Re-application or replacement within the 90-day period shall be done at no additional cost to the Department.

Glass beads, tapes and paints used for temporary pavement markings shall be lead free, conform to M7.01.07, M7.01.16, M7.01.23 and M7.01.24 and meet the retroreflectivity requirements of the MUTCD for a period of 90 days. Final determination as to pavement marking quality shall be made by the Engineer. The Contractor shall supply a retroreflectometer for this purpose.

The colors of the marking materials shall be the standard highway colors of white or yellow and as outlined in the MUTCD.

Temporary Raised Pavement Markers shall conform to M9.30.6: Temporary Raised Pavement Markers.

PAVEMENT MARKING REMOVAL

Pavement Marking Removal consists of removing existing pavement markings as required to support the Temporary Traffic Control Plan and as directed by the Engineer. Raised Pavement Marker Removal consists of removal and disposal of the existing raised pavement markers including filling the void.

Existing pavement markings shall be removed to the fullest extent possible by an approved method. Pavement marking removal methods shall not cause damage to the pavement or cause drastic change in texture, which could be construed as delineation at night, and shall be approved by the Engineer. It is not permissible to paint over existing markings with black paint in lieu of removal. Approved methods include but are not limited to:

1. High pressure air.
2. High pressure water (cold weather use not permitted)
3. Sand blasting,
4. Mechanical devices such as grinders, sanders, scrapers, scarifiers and wire brushes.

Painting over a pavement marking line by use of asphaltic liquids or paints will not be permitted. Conflicting pavement markings shall be removed before any change is made in the traffic pattern.

Material deposited on the pavement as a result of removing markings shall be removed as the work progresses. Accumulations of sand or other material, which might interfere with drainage or could constitute a hazard to traffic, will not be permitted.

Any damage to the pavement or surfacing caused by pavement marking removal shall be satisfactorily repaired at no additional cost to the Department.

Where the removal operation is being performed near a lane occupied by traffic, a vacuum attachment operating concurrently with the removal operation must be in use. All residue shall be removed immediately from the surface being treated.

REFLECTORIZED DRUM

Reflectorized Drums consists of furnishing, positioning, repositioning, maintaining, and removing reflectorized plastic drums and necessary ballast, as needed and/or as directed by the Engineer.

Reflectorized drums shall conform to M9.30.9: Reflectorized Drum. Warning lights shall conform to the MUTCD Type A. All drums shall be maintained in a satisfactory manner including the removal of dirt and road film that causes a reduction in sheeting retroreflective efficiency.

The work under these items shall consist of installing and maintaining reflectorized drums to support work outside of fixed work zones and as requested by the Engineer.

36 inch high reflectorized cones may be used in lieu of reflectorized drums outside of tapers.

6 INCH REFLECTORIZED LINES (EPOXY)

The work to be done under these items shall conform to the relevant provisions of Section 860 of the Standard Specifications.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 852, will be measured and paid at the Contract unit price per Square Foot (SF), complete in place, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment will be made for removal and disposal of the sediment from the insert, but all costs in connection therewith shall be included in the Contract unit price bid.

Item 853.1, Portable Breakaway Barricade Type III will be measured as one unit each regardless of size, and paid at the will be paid for at the contract unit price each (EA) which shall provide full compensation for all material, labor and equipment necessary to furnish, install, maintain, move and remove the barricades. Portable Breakaway Barricades Type III will be paid for at the contract unit price each which shall provide full compensation for all material, labor and equipment necessary to furnish, install, maintain, move and remove the barricades.

Item 853.2, Temporary Barrier and Item 853.21, Temporary Barrier Removed and Reset will be measured by the foot, in place. Barrier removed and reset for the purpose of gaining access to the construction work zone shall not be measured for payment. Any barrier removed and reset for the convenience of the Contractor will not be measured for payment. Temporary Barrier will be paid for at the contract unit price per foot (FOOT) which shall provide full compensation for furnishing, installing, delineating, aligning, maintaining and final removal of the temporary barrier. Temporary Barrier Removed and Reset will be paid for at the contract unit price per foot (FOOT) which shall provide full compensation for removing, relocating, re-setting, re-aligning, transporting and maintaining the temporary barrier including delineation, as specified above. The Contractor will be paid Removed and Reset each time the barrier is relocated either to a new work zone, to off-season storage, or back to the project from storage. The Contractor will not be separately compensated for

Item 853.501 and Item 853.72 will be measured and paid for at the contract unit price of Each (EA)

Item 854.036 Temporary Pavement Markings will be measured and paid for at the contract unit price per foot (FT) which shall include full compensation for furnishing, installing, maintaining and removing, the markings and markers.

Item 854.1 Pavement Marking Removal will be measured and paid for at the contract unit price per square foot (SF) which shall provide full compensation for removing existing markings including any necessary repairs to the roadway surface.

Item 859, Reflectorized Drum will be measured and paid will be measured by the day. Each period of up to 24 hours during which a reflectorized drum is in use will be measured as one day regardless of the number of times that the drum is positioned, repositioned, removed or returned to service. Reflectorized Drums will be paid for at the contract unit price per day (DAY) which shall include full compensation for furnishing, positioning, repositioning, and removing Reflectorized Drums as directed by the Engineer. Flashing lights as shown on the Temporary Traffic Control Plan shall be considered incidental to Item 859. Reflectorized Drum.

Measurement of Item 866.106 and Item 867.106 shall be actual length and paid for at the contract unit price per Foot (FT), complete in place, which shall include the cost of furnishing all labor, materials and equipment required or incidental to satisfactorily complete the work. The cost of maintaining and protecting traffic during the marking operations shall be included in the bid price. No payment will be made for the repair or replacement of defective pavement markings.

<u>ITEM 945.10</u>	<u>DRILLED MICROPILES</u>	<u>FOOT</u>
<u>ITEM 948.60</u>	<u>MICROPILE VERIFICATION LOAD TEST</u>	<u>EACH</u>
<u>ITEM 948.61</u>	<u>MICROPILE PROOF LOAD TEST</u>	<u>EACH</u>

GENERAL

This item shall conform to the requirements of all relevant Sections of the Standard Specifications and Supplemental Specifications.

This work shall consist of constructing micropiles as shown on the plans, approved working drawings, and as specified herein. The Contractor is responsible for furnishing all materials, equipment, labor, services, and supervision; and for selecting means and methods for the installation and testing of micropiles for this project.

Micropiles shall consist of permanent casing sections and fully reinforced grout sections bonded with in-situ soil. Permanent casings shall be included as part of the micropiles and shall remain in place after grouting is complete. Temporary casings shall be installed if necessary to facilitate micropile construction and shall be removed during or after grouting. The Contractor is responsible for drilling through obstructions encountered during pile installation.

The micropiles load capacities shall be confirmed by verification and proof load testing. Testing must meet the test acceptance criteria specified herein. The bond length of the micropile may be modified by the Engineer, pending results of load testing performed as an initial part of the work.

MATERIALS

The materials for micropiles shall meet the following requirements:

Permanent/Drill Steel Casing used as Reinforcement: Permanent steel casing/pipe used as reinforcement shall be new "Prime" steel meeting the requirements of any API 5L PSL1 pipe with a yield strength of 52 ksi with SR15 supplemental requirements. The grade of the prime steel casing shall conform to the properties shown on the Plans. For steel pipe that is to be welded, the Carbon Equivalency, as defined in AWS D1.1 Section XI.1, shall be less than or equal to 0.45, as demonstrated by mill certificates. The sulfur content shall not exceed 0.05%, as demonstrated by mill certificates.

Permanent steel casing shall consist of ERW (Electric Resistance Welded) and/or seamless steel casing and shall be designed to withstand the design loadings determined by the Engineer or shown on the Plans and the verification/proof test loading described in this specification. Joints shall develop the full vertical capacity, and at least 60% of the moment capacity of the casing. As installed, there shall be no joints within three feet or as shown on the plans from the bottom of the pile cap.

The steel casing shall have certified mill test reports and shall be submitted for record purposes as the materials are delivered. The steel shall be traceable back to the mill certifications, and be free from defects (dents, cracks, tears, etc.).

New "mill secondary" steel pipe/casing will not be accepted regardless if they are accompanied by coupon test results.

Permanent steel casing shall be installed a minimum of 12 inches into the in-situ soil bond zone.

Reinforcing Bars: Central reinforcing steel shall be full-length, continuously threaded bars. The bars shall conform to AASHTO M 31 Grade 60 or Grade 75, or AASHTO M 275 Grade 150 as shown on the Contract Documents. The grade and size of the central reinforcement shall conform to any minimum and/or maximum properties shown on the Plans.

Reinforcing Bar Couplings: Reinforcing bar couplers shall be in accordance with Subsection M8.01.9 but are not required to be listed on the Qualified Construction Materials List (QCML). Where reinforcing bars are not specified with corrosion protection, bar couplers shall not be required to be epoxy coated or galvanized.

Independent testing shall be performed by a nationally recognized testing laboratory, approved by the Engineer, which shall provide certified test results showing that the reinforcing bar coupler meets the requirements of Subsection M8.01.9. Acceptance of the couplers shall be approved by the Engineer.

Centralizers and Spacers: Centralizers and spacers shall be fabricated from schedule 40 PVC pipe or tube, or material non-detrimental to the reinforcing steel. Wood shall not be used.

They shall be securely attached to the reinforcement; sized to position the reinforcement to provide the grout cover specified in the table below; sized to allow grout tremie pipe insertion to the bottom of the drill hole; and sized to allow grout to freely flow up the drill hole and casing.

Table 1 - Minimum Grout Cover for Steel Reinforcement

Condition	Minimum Cover on Bar (in.)	Minimum Cover on Coupler (in.)
Micropiles in Soil	1	$\frac{1}{4}$
Micropiles in Rock	$\frac{1}{2}$	$\frac{1}{4}$
Coated or Encapsulated Bars	$\frac{1}{2}$	$\frac{1}{4}$

Admixtures for Grout: Admixtures shall conform to the requirements of AASHTO M 194 and shall be selected from the QCML where applicable. Expansive admixtures shall only be added to the grout used for filling sealed encapsulations or micropile top connections. Accelerators are not permitted. Admixtures containing intentionally added chlorides are not permitted. Admixtures shall be from the same Manufacturer and shall be compatible with the grout and mixed in accordance with the Manufacturer's recommendations.

Admixtures that control bleed, improve flowability, reduce water content, and retard set may be used in the grout subject to review and acceptance by the Engineer.

Cement: All cement shall conform to AASHTO M 85 Type I, Type II, Type III, or Type V and shall be the product of one Manufacturer.

Grout: Neat cement mixture with a minimum 3-day compressive strength of 50 percent of the 28- day unconfined compressive strength. The grout shall be proportioned and mixed as to provide a fluid grout capable of maintaining the solids in suspension without appreciable bleed. Preparation and

placement of grout shall be in accordance with the recommendations of "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," ACI 304.

A minimum of 60 calendar days prior to the start of micropile construction the grout mix design shall be submitted to the Engineer and a trial batch shall be performed. The trial batch shall take place at a location approved by the Engineer and be performed in the presence of Department personnel. It shall be representative of the production grout placement and shall consist of the same materials, equipment, methods of mixing, and sample preparation and curing methods.

Trial batch samples will be tested to verify that the material meets all grout criteria specified in Table 2. The quantity of material batched shall be sufficient to perform all required tests specified.

Table 2 – Grout Material Acceptance Criteria for Trial Batch Testing

Quality Characteristic	Test Method	Engineering Limit
Minimum Compressive Strength:	AASHTO T 106 Or AASHTO T 22	
3 days		≥ 2000 psi
7 days		For information only
28 days		≥ 4000 psi
Consistency	API RP-13B-1	$\pm 10\%$ of the density specified in the mix design

Plates and Shapes: Structural steel plates and shapes for pile top attachments shall conform to M8.05.0, AASHTO M 270, and have minimum yield strength of 50 ksi.

Water: Water for mixing grout shall be potable, clean, and free from substances that may be injurious to cement and steel.

Fillers: Inert fillers such as sand (conforming to AASHTO M 45) may be used in the grout in special situations, such as presence of large voids in the ground or when grout take and travel are to be limited, with prior written approval by the Engineer.

CONSTRUCTION METHODS

QUALIFICATIONS

The Micropile Contractor must be experienced in the construction and load testing of micropiles and have successfully constructed at least 5 projects in the last 5 years involving construction totaling at least 100 micropiles with similar capacity and requirements specified in these plans and specifications. The Micropile Contractor shall have previous micropile drilling and grouting experience in soil/rock similar to project conditions and shall have available and be thoroughly familiar with the specialized type of equipment needed to perform work of this type.

The on-site foremen and drill rig operators shall also have experience on at least 3 projects over the past 5 years installing micropiles of equal or greater capacity than required in these plans and specifications.

Prior to the Pre-construction Meeting, the Micropile Contractor shall submit the following information to verify the firm's experience and the qualifications of personnel scheduled to perform the micropile

design (load test frame) and construction:

221. Submit a list of at least five micropile projects successfully completed in the last five years. Include construction details, structural details, load test reports, and client contact for each project listed.
222. Submit a list of the equipment and resources the Micropile Contractor plans to mobilize and utilize for the performance of the project.
223. Provide the names and detail the experience of the micropile designer, on-site supervisor, foremen, and drill rig operators for this project.
224. A signed statement that the Micropile Contractor has inspected both the project site and all the subsurface information including any soil or rock samples made available in the Contract Documents.

Work on any micropiles shall not be started, nor materials ordered until the qualifications and submittals have been accepted by the Engineer. The Engineer may suspend the micropile construction if the Micropile Contractor substitutes unapproved personnel during construction. Requests for substitution of field personnel shall be submitted to the Engineer for acceptance. Additional costs resulting from the suspension of work will be the Micropile Contractor's responsibility, and no extension in contract completion date resulting from the suspension of work will be allowed.

The Micropile Contractor shall have, on site during all micropile construction activity, a minimum of one Quality Control (QC) inspector. This person shall be responsible for quality control of the micropiles during all phases of construction and will monitor and document all QC inspection and testing activities required by the specifications and outlined in the accepted procedures and Working Drawings. The QC person shall be a certified NETTCP Concrete Technician.

MICROPILE PRE-CONSTRUCTION SUBMITTALS

The Contractor shall prepare and submit to the Engineer: shop drawings, a micropile installation plan, construction procedures, load testing procedures, and equipment calibrations for review and acceptance. The Contractor shall verify the limits of the micropile structure before preparing the detailed working drawings and allow the Engineer four (4) weeks to review the submittal after a complete set has been received. Work shall not begin, nor materials ordered until all submittals have been received, reviewed, and accepted in writing by the Engineer.

The micropile submittals shall include:

- a. Plans
 1. A plan view of the micropile layout identifying the locations of micropiles, numbering system for records, and verification test and proof test micropile locations.
 2. An elevation view of the test micropile(s) showing:
 - A. A typical detail of test micropiles defining the micropile length, reinforcement, inclination, and load test bonded and unbonded test lengths.
 - B. Permanent casing length and diameter, casing plunge length, and grout bond zone length.
 - C. Estimated soil/bedrock strata.

- D. Instrumentation to be installed.
 - E. Minimum drill hole diameter.
 - F. Splice type and locations.
 - G. Centralizers and spacers.
 - H. Corrosion protection details.
 - I. Grout design strength.
3. Details for constructing micropile structures around utilities, as applicable.

b. Construction Procedures

- 1. Detailed step-by-step description of the proposed micropile construction procedure, including personnel, testing, and equipment to assure quality control. This step-by-step procedure shall be shown in sufficient detail to allow the Engineer to monitor the construction and quality of the micropiles. Include methods of drilling the holes, advancing the casing, drilling through or removing obstructions, flushing drilled holes, installing reinforcement, and grout pressures.
- 2. If welding of casing is proposed, submit the welding procedure. All welding shall be done in accordance with the current AWS Structural Welding Code.
- 3. Information on space requirements for installation equipment that verify the proposed equipment can perform at the site.
- 4. Plan describing how surface water, drill flush, and excess waste grout will be controlled and disposed.
- 5. Certified mill test reports for the central reinforcing steel. The ultimate strength, yield strength, elongation, and material properties composition shall be included.
- 6. Certified mill test reports for the permanent casing. Certification that the permanent casing meets the supplemental requirements of SR15 shall be included.
- 7. Quality Control Plan. The QC Plan should sufficiently document the QC processes of all Contractor parties (i.e. Prime Contractor and Subcontractors) performing work required under this specification. The QC Plan shall be structured to follow the format and section headings outlined in the MassDOT Model QC Plan. It shall be submitted to the Engineer for review and approval a minimum of 30 days prior to the start of work.

The QC Plan shall include complete descriptions, and details for the following:

- A. Micropile installation including drilling method and grouting procedure.
- B. Grout mix design and type of materials to be used in the grout including certified test data and trial batch reports. The Micropile Contractor shall also provide specific gravity and density of the wet mix design.
- C. Methods and equipment for accurately monitoring and recording the grout depth and grout volume as the grout is being placed.
- D. Estimated curing time for grout to achieve specified strength. Previous test results for the proposed grout mix completed within one year of the start of grouting may be submitted for initial verification and acceptance, and start of production work. During production, grout shall be tested in accordance with the Grout Testing Requirement

specified herein.

- E. Procedure and equipment for Micropile Contractor monitoring of grout quality. At a minimum, the Micropile Contractor shall verify the specific gravity of the mixed grout prior to placement of the grout into each drilled micropile.

c. Load Testing Procedures

Detailed plans and procedures for the proposed micropile load testing method. This shall include all drawings, details, and structural design calculations necessary to clearly describe the proposed test method, reaction load system capacity and equipment setup, types and accuracy of apparatus to be used for applying and measuring the test loads and pile top movements in accordance with the Micropile Load Testing section of this specification.

d. Equipment Calibration

Calibration reports and data for each test jack, pressure gauge, master pressure gauge, and electronic load cell to be used. The calibration tests shall have been performed by a certified testing laboratory, and tests shall have been performed within 90 calendar days of the date submitted. Testing shall not commence until the Engineer has reviewed and accepted the jack, pressure gauge, master pressure gauge, and electronic load cell calibration data.

PRE-CONSTRUCTION MEETING

A mandatory pre-construction meeting will be scheduled by the Engineer and held prior to the start of micropile construction. The Design Consultant, Resident Engineer, Prime Contractor, and Micropile Contractor, including QC personnel, shall attend the meeting. The preconstruction meeting will be conducted to clarify the construction and QC requirements for the work, to coordinate the construction schedule and activities, specifically those pertaining to excavation for micropile structures, installation of temporary sheeting, anticipated subsurface conditions, micropile installation and testing, micropile structure survey control, and site drainage control.

SITE DRAINAGE CONTROL

The Contractor shall control and properly dispose of drill flush and construction related waste, including excess grout, in accordance with related specifications within the Contract Documents, and all applicable local codes and regulations. Provide positive control and discharge of all surface water that will affect construction of the micropile installation. Maintain all pipes or conduits used to control surface water during construction. Repair damage caused by surface water at no additional cost. Upon substantial completion of the work, remove surface water control pipes or conduits from the site.

EXCAVATION

Coordinate the work and the excavation so the micropile structures are safely constructed and remain stable at all times. Perform the micropile construction and related excavation in accordance with the plans and accepted submittals. No excavation deeper than those specified herein or shown on the plans will be made above or below the micropile structure locations without written acceptance of the Engineer.

MICROPILE INSTALLATION

1 General

The Micropile Contractor shall select the drilling method, the grouting procedure, and the grout pressure used for installation of the micropiles. The construction method shall incorporate any special

construction requirements specified on the plans. The production micropiles and its construction method shall be identical to the accepted verification test piles.

Piles shall be installed only in the presence of the Engineer's Representative.

2 Location and Survey

Micropiles shall be located and marked using survey and a template by the Contractor who shall maintain and be responsible for all location and elevation stakes.

3 Drilling

The drilling equipment and methods shall be suitable for drilling through the conditions to be encountered, without causing damage to overlying or adjacent structures, buried structures, or utilities.

Temporary casing or other accepted method of pile drill hole support is required, when drilling within 10 feet of an existing foundation, or utility, and/or in caving or unstable ground, to permit the pile shaft to be formed to the minimum design drill hole diameter. The casing shall be of the type and thickness that can be installed without distortion. Casings that fail, fracture, or otherwise distort during drilling or after drilling shall, unless otherwise directed, be withdrawn or replaced at the Contractor's expense. The drill hole must be open along its full length to at least the design minimum drill hole diameter prior to placing grout and reinforcement. The Contractor's proposed method(s) to provide drill hole support and to prevent detrimental ground movements shall be reviewed by the Engineer. Detrimental ground movement is defined as movement which requires remedial repair measures, in order to maintain site conditions as determined by the Engineer. Do not progress a new hole, pressure-grout, or post-grout, within a radius of 5 pile diameters or 5 feet, whichever is greater, of a micropile until the grout for that micropile has set 24 hours or longer. Do not allow vibration or excessive wheel loads to influence piles during installation and construction.

Use of drilling fluid containing bentonite or any other non-reverting drilling fluid is not permitted. Use of polymer slurry to remove cuttings from the cased hole shall be approved by the Engineer.

Piles shall be installed using equipment capable of penetrating boulders, cobbles, bedrock, dense till material, granite blocks, timber, concrete, or other man-placed materials that hinder the advance of the pile.

Use of drop-type impact hammers and blasting are not permitted. Prior to the use of down the hole air drilling methods the Contractor shall provide temporary fencing or barriers as necessary to prevent cuttings from leaving the work area and entering the adjacent traffic lanes.

Micropiles shall not be installed using auger cast methods.

Permanent casing must be installed in a manner which will not loosen the adjacent soils and will result in intimate contact between the casing and the soil. Driving of casing will not be allowed. Drilling shall be performed such that cuttings and/or wash fluid return through the inside of the casing. External flush will not be allowed. The method of drilling used shall prevent the loss of ground due to erosion, jetting, or blow- in at the bottom of the casing. No open-hole drilling will be allowed unless accepted by the Engineer.

4 Ground Heave or Subsidence

During construction, the Contractor shall observe the ground conditions in the vicinity of the micropile construction site on a daily basis for signs of ground heave or subsidence. Immediately notify the Engineer if signs of movements are observed. The Contractor shall immediately suspend or modify

drilling or grouting operations if ground heave or subsidence is observed, if the micropile structure is adversely affected, or if adjacent structures are damaged from the drilling or grouting. If the Engineer determines that the movements require corrective action, the Contractor shall take corrective actions necessary to stop the movement or perform repairs. When due to the Contractor's methods or operations or failure to follow the specified/accepted construction sequence, as determined by the Engineer, the costs of providing corrective actions will be borne by the Contractor.

5 Pipe Casing and Reinforcing Bars Placement and Splicing

Reinforcement shall be placed prior to grouting the drill hole. Reinforcement surface shall be free of deleterious substances such as soil, mud, grease, or oil that might contaminate the grout or coat the reinforcement and impair bond. Reinforcement in the bond zone [i.e. rock socket] shall extend the minimum required length.

The Contractor shall install all micropiles to the planned elevations.

Centralizers and spacers shall be provided at a maximum spacing of 10 feet on center. The upper- and lower-most centralizers shall be located a maximum of 5 feet from the top and bottom of the micropile, respectively. Centralizers and spacers shall permit the free flow of grout without misalignment of the reinforcing bar(s) and permanent casing. The reinforcing steel shall be inserted into the drill hole to the desired depth without difficulty. Partially inserted reinforcing bars shall not be driven or forced into the hole. The Contractor shall re-drill and reinsert reinforcing steel when necessary to facilitate insertion.

Lengths of casing and reinforcing bars to be spliced shall be secured in proper alignment and in a manner to avoid eccentricity or angle between the axes of the two lengths to be spliced. Splices and threaded joints shall meet the requirements of the Material section. Threaded pipe casing joints shall be located at least two casing outside diameters (O.D.) from a splice in any reinforcing bar. When multiple bars are used, bar splices shall be staggered at least 1 foot.

6 Grouting

Micropiles shall be grouted the same day the load transfer bond length is drilled, or the bond length shall be flushed prior to grouting procedures commence. The grouting equipment shall produce a grout free of lumps and undispersed cement. Admixtures, if used, shall be mixed in accordance with Manufacturer's recommendations. The Contractor shall have means and methods of measuring the grout quantity and pumping pressures during the grouting operations. The grout pump shall be a positive displacement pump equipped with a pressure gauge to monitor grout pressure. A second pressure gauge shall be placed at the point of injection into the pile top. The pressure gauge shall be capable of measuring pressures of at least 145 psi or twice the actual grout pressure used, whichever is greater. The grout shall be kept in agitation prior to pumping. Grout shall be placed within one hour of mixing. The grouting equipment shall be sized to enable each pile to be grouted in one continuous operation. The grout volume being pumped shall be measured to an accuracy of 10 percent.

The hole shall be flushed with clean water immediately prior to grouting, to remove all contaminated water and cuttings. The hole shall be flushed through the grout pipe fully extended to the bottom of the hole with the temporary casing (if any) in place. The water shall be pumped at a high velocity until the wash water at the top of the casing is clear. After flushing, the depth of the hole shall be measured to confirm that the hole is clean and no sediment exists at the bottom of the drilled rock-socket/bond length. Installation of the steel reinforcing and grouting shall be done immediately after flushing. In case of delay, the hole shall be re-flushed and rechecked prior to grouting as directed by the

Engineer.

The grout shall be injected from the lowest point of the drill hole, and injection shall continue until uncontaminated grout flows from the top of the pile. Temporary casing, if used, shall be extracted in stages ensuring that, after each length of casing is removed, the grout level is brought back up to the proposed level before the next length is removed. The use of compressed air to directly pressurize the fluid grout takes is not permissible. The tremie pipe or casing shall always extend below the level of the existing grout in the drill hole during grouting procedures. The grout takes shall be controlled to prevent excessive heave or fracturing of rock or soil formations. The entire micropile shall be grouted to the design cut-off level. Upon completion of grouting, the grout tube may remain in the hole, but must be filled with grout.

If the Contractor elects to use a post-grouting system, Working Drawings and relevant details including grouting pressure, volume, location and mix design, shall be submitted to the Engineer for review.

7 Construction Tolerance

Unless otherwise stated on the Plans, the following shall be the maximum construction tolerances for micropiles:

- Centerline of piling shall not be more than 3 inches from indicated plan location.
- Pile shall be plumb within 2 percent of total-length design plan alignment.
- Battered piles inclined up to 1:6 shall be within 4 percent of design plan alignment.
- Battered piles inclined greater than 1:6 shall be within 7 percent of design plan alignment.
- Top elevation of pile shall be plus 1 inch or minus 2 inch maximum from vertical design elevation indicated.
- Centerline of reinforcing steel shall not be more than 3/4 inches from indicated center of pile.
- Minimum volume of grout placed shall be the 110% of the theoretical volume of the whole micropile length from bottom to top at time of grouting.

8 Micropile Installation Records

The Contractor shall prepare and submit to the Engineer full-length installation records for each micropile installed. The records shall be submitted within one work shift after that pile installation is completed. The data shall be recorded on a micropile installation log. A separate log shall be provided for each micropile. The log for each micropile shall contain the following minimum information:

- Project name, structure name, micropile number, and contract number.
- Date and time of drilling, grouting, and completion.
- Bottom elevation of the proposed footing and final top elevation of the micropile, to the nearest 0.1 feet.
- Plumbness and deviation from design location and batter.
- Micropile as-built information such as pile inclination, casing diameter and wall thickness, reinforcement size and length, casing length below bottom of footing, taped measurement inside casing to check cleanout, plunge length (cased bond length), bond length below casing, total pile length below and above bottom of footing. All dimensions shall be provided to the nearest 0.1 feet.

- Drilling method, drill bit type and size, and drill operator's name.
- Table showing the descriptions and approximate top and bottom elevation of each soil or rock layer encountered during pile drilling.
- Grout mix, density, and quantity used, for initial grout and post-grout (if any) including cement type and admixtures.
- Maximum and average grout pressure used during installation.
- Damage (if any) to pile, description of any deviations from the design location and batter or from the approved pile design and installation procedures, and description of any unusual occurrences during drilling (including obstructions), installation, and grouting.

The example micropile installation log in the "Micropile Design and Construction Guidelines Manual," Report No. FHWA-NHI-05-039 or FHWA-SA-97-070 can be used as a reference in developing the micropile installation log.

The Contractor shall also submit within 2 weeks after installation of all piles, an as-built plan, certified by a surveyor, showing the as-installed location of all piles to the nearest $\frac{1}{2}$ inch.

CONSTRUCTION QUALITY ASSURANCE

CONTRACTOR QUALITY CONTROL

The Contractor's QC personnel will perform Quality Control inspection, sampling, and testing to ensure that the processes are providing work conforming to the contract requirements. Inspection, sampling, and testing shall be documented on appropriate forms and provided to the Engineer. The Engineer will not sample or test for Quality Control or assist in controlling the Contractor's operations.

J. Testing

1. Grout consistency: As measured by grout density shall be determined by the Contractor per API RP-13B-1 at a frequency of at least one test per pile, conducted just prior to start of pile grouting. The Baroid Mud Balance used in accordance with API RP-13B-1 is an approved device for determining the grout density of neat cement grout. The measured grout density shall be within $\pm 10\%$ of the density specified in the grout mix design submittal.
2. Compressive Strength: Grout within the micropiles shall be tested by the Contractor's Quality Control Inspector to ensure that it attains the minimum required compressive strength.

Micropile grout shall be sampled and cured in accordance with AASHTO R 64 (for 2 inch by 2 inch cubes) or T 23 (for 3 inch by 6 inch cylinders) and tested for compressive strength in accordance with AASHTO T 106 (for cubes) or T 22 (for cylinders). Grout samples shall be taken directly from the grout plant (on-site mixer and pump).

The QC Technician will take the following sets of grout samples for QC testing:

- A. Verification Test Piles – three (3) sets of three (3) cubes or cylinders for 3-, 7-, and 28-day strength testing.
- B. Proof Test Piles – three (3) sets of three (3) cubes or cylinders for 3-, 7-, and 28-day strength testing.
- C. Production Piles – one (1) set of three (3) cubes or cylinders for 28-day strength testing for every two (2) micropiles or one set from each grout plant on each day of operation;

whichever occurs more frequently.

The Contractor shall provide grout cube compressive strength, grout density, can grout volume results to the Engineer within 24 hours of testing.

Table 3 – Grout Material Acceptance Criteria

Quality Characteristic	Test Method	Engineering Limit
Minimum Compressive Strength:	AASHTO T 106 or AASHTO T 22	
3 days		≥ 2000 psi
7 days		For information only
28 days		≥ 4000 psi
Consistency	API RP-13B-1	$\pm 10\%$ of the density specified in the mix design
Volume		\geq Theoretical volume of hole

ACCEPTANCE

The Engineer is responsible for performing all Acceptance activities and making the final Acceptance determination. The Engineer's Acceptance system will include monitoring the Contractor's QC activity, performing Acceptance inspection, and utilizing available sampling and testing data.

K. Inspection

The Engineer will perform Acceptance inspection of all work items to ensure that all materials and completed work are in conformance with the contract requirements.

L. Testing

The Engineer will determine whether it will test 2-inch cubes or 3-inch by 6-inch cylinders for its Acceptance testing. The Contractor will be required to provide to the Engineer a sufficient amount of approved 2-inch cube molds or 3-inch cylinders. If it is determined that the Engineer will test 3-inch cylinders then a correlation between the 2-inch cube results and the 3-inch cylinders shall be determined by the Engineer.

The Engineer will take the following sets of grout samples for Acceptance testing:

- Verification Test Piles – 3 sets of cubes or cylinders for 3-, 7-, and 28-day strength testing.
- Proof Test Piles – three (3) sets of three (3) cubes or cylinders for 3-, 7-, and 28-day strength testing.
- Production Piles – one (1) set of three (3) cubes or cylinders for 28-day strength testing for every two (2) micropiles or one set from each grout plant on each day of operation; whichever occurs more frequently.

Pile verification or proof load testing shall not be performed until the Engineer has confirmed the grout has reached the minimum 3-day design strength specified in Table 4.

Table 4 – Grout Material Acceptance Criteria

Quality Characteristic	Test Method	Engineering Limit
Minimum Compressive Strength:	AASHTO T 106 or AASHTO T 22	
3 days		≥ 2000 psi
7 days		For information only
28 days		≥ 4000 psi

MICROPILE LOAD TESTING

M. General

The Contractor shall perform pre-production verification pile load testing on one sacrificial pile per bond zone bearing stratum. The number and location of the verification test(s) shall be as specified on the Plans. In general, the location of the verification test(s) shall be within 10 feet of the footprint of a substructure unit, but at least 5 feet from any production pile as selected by the Contractor and accepted by the Engineer.

Pile proof load testing shall be performed on actual production micropiles and shall be performed on one pile per substructure unit or five percent of the total number of piles, whichever is greater, in conformance with the approved working drawings and testing procedures. The production proof test pile(s) shall be at a location selected by the Contractor and accepted by the Engineer.

The load tests shall conform to the requirements of ASTM D1143 (vertical compression load testing) or ASTM D3689 (vertical tension load testing) except as modified herein. The maximum test loads shall be 150% of the Factored Design Load (FDL) for the micropile verification test and 100% of the FDL for Micropile Proof Test. The Factored Design Load is defined as the Factored Axial Design Load (compression and/or tension) as shown on the Plans. The maximum test loads shall be as specified above but not more than 80% of the structural capacity of the micropile elements, to include steel yield in tension, steel yield or buckling in compression, or grout crushing in compression. The structural elements of the verification test micropile may be modified for testing the FDL of the micropile as accepted by the Engineer. The Alignment Load (AL) should not be more than 0.04 FDL.

Before starting the work, the Contractor shall submit to the Engineer for acceptance, a pile load test plan including a written description of the equipment and methods which are intended to be used. The methods must be of an accepted type and shall be altered as necessary to meet the acceptance of the Engineer. The pile load test plan and description shall be prepared and stamped by a professional engineer registered in the Commonwealth of Massachusetts.

Grout within the micropile verification test pile shall attain the minimum required 3-day compressive strength prior to load testing. The top elevation of the test pile shall be determined immediately before the load testing. The head of each micropile shall be cut-off level or capped to produce a level horizontal bearing surface.

The Contractor shall provide all personnel and equipment needed to perform the test, measure loads

and movements, and record test data. A representative of the Department or the Engineer may observe and witness the test and record data independently. No testing is to be performed unless all the agreed representatives are present.

Testing equipment shall include dial gauges, dial gauge support, jack and pressure gauge, electronic load cell, and a reaction frame. The Contractor shall provide a description of test setup and jack, pressure gauge and load cell calibration curves in accordance with the submittals Section.

Design the testing reaction frame to be sufficiently rigid and of adequate dimensions such that excessive deformation of the testing equipment does not occur. Provide a reaction frame capable of safely supporting 125 percent of the maximum test load. Align the jack, bearing plates and stressing anchorage such that unloading and repositioning of the equipment will not be required during the test.

Apply and measure the test load with a hydraulic jack and pressure gauge. The pressure gauge shall be graduated in 100 psi increments or less. The jack pressure gauge shall have a pressure range not exceeding twice the anticipated maximum test pressure. The jack shall be positioned at the beginning of the test such that unloading and repositioning during the test will not be required.

Calibrate the test load jacking system including the hydraulic jack couplings, gas pump, pressure gauge, and hydraulic load cell prior to the test so that the load applied is controlled to within 3 percent of the total applied load. Submit calibration reports prior to the start of the pile load test. Monitor the creep test load hold during verification tests with both the pressure gauge and the electronic load cell. Use the load cell to accurately maintain a constant load hold during the creep test load hold increment of the verification test.

Readings of settlement and rebound shall be referred to a fixed benchmark and shall be made using at least three dial gauges (micrometer dial extensometers) graduated to 0.001 inches and located 120 degree intervals around the micropile. The gauges shall be mounted on a reference beam supported at each end by reliable supports located at least 10 feet from the center of the test pile and independent from the jack, pile, or reaction frame.

The dial gauges shall have a travel sufficient to allow the test to be done without having to reset the gauges. Visually align the gauges to be parallel with the axis of the micropile. Readings shall be taken at intervals specified in the Verification Test and Proof Test section.

The Contractor shall establish a survey reference point on the test pile and another reference point at the center of the reference beam. The reference points shall consist of graduated scales machine-divided into 0.02 inch and attached securely to the pile and reference beam. The reference points shall be monitored using survey equipment during the pile load test.

Protect the settlement measuring system against rain, wind, frost, and any other disturbances that could affect the reliability of the settlement observations. Provide sun shading for the measuring system for the duration of the test and for a minimum of 1 hour prior to the start of the test.

N. Micropile Verification Test

The Contractor shall perform pre-production verification pile load testing on sacrificial piles at a location selected by the Contractor and accepted by the Engineer. The location of the verification tests shall be within 10 feet of footprint of a substructure unit but at least 5 feet away from any production pile. Testing shall be performed in compression or tension in accordance with ASTM D1143 or ASTM D3689, respectively, except as modified herein.

Verification load tests shall be performed to verify that the Contractor installed micropiles will meet the

required FDL and load test acceptance criteria and to verify that the length of the micropile bond zone is adequate. The drilling-and-grouting method and casing outside diameter shall be identical to those specified for the production piles as indicated on the Plans.

Verification test piles shall be installed at the location accepted by the Engineer. The steel core may need to have a higher strength or a larger diameter than for the production piles to accommodate the test load.

Verification test piles shall include at least two, $\frac{3}{4}$ -inch diameter PVC Schedule 40 pipes cast into the test pile to allow telltales to be installed for load testing. The pipes shall be securely fastened in straight alignment to prevent displacement during grouting. The pipes shall be sealed at the bottom with threaded steel caps and at the top with threaded PVC plugs. The pipes shall extend within one foot of the top and bottom of the bearing stratum (i.e. unbonded zone of the pile) at the test pile location. Strain gages may be substituted for telltales.

The micropile verification load test results must verify the micropile design and installation methods, and be reviewed and accepted by the Engineer prior to beginning installation of production micropiles. The verification test pile and reaction piles shall not be used as production piles.

Test verification pile to a maximum Test Load of 150% of the Factored Design Load (FDL) defined above, as indicated on the Plans. The verification pile load test shall be made by incrementally loading the micropile in accordance with the following cyclic load schedule:

Step	Loading	Applied Load	Hold Time (min.)
1	Cycle 1	AL	-
		0.075 FDL	4
		0.15 FDL	4
		0.225 FDL	4
		0.30 FDL	4
		0.375 FDL	4
2	Cycle 2	AL	1
		0.15 FDL	1
		0.30 FDL	1
		0.375 FDL	1
		0.45 FDL	4
		0.525 FDL	4
		0.60 FDL	4
		0.675 FDL	4
		0.75 FDL	4

3	Cycle 3	AL	1
		0.30 FDL	1
		0.60 FDL	1
		0.675 FDL	1
		0.75 FDL	1
		0.875 FDL	4
		0.90 FDL	4
		0.975 FDL	4
		10 or 60 (Creep Test)	
4	Cycle 4	AL	1
		0.30 FDL	1
		0.60 FDL	1
		0.90 FDL	1
		0.975 FDL	1
		1.05 FDL	4
		1.125 FDL	4
		1.20 FDL	4
		1.275 FDL	4
		1.35 FDL	4
		1.425 FDL	4
		1.50 FDL	4
		1.20 FDL	4
		0.90 FDL	4
		0.60 FDL	4
		0.30 FDL	4
		AL	15

Creep Test: Pile top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. The verification test pile shall be monitored for creep at the 0.975 FDL. Depending on performance, either a 10 minute or 60 minute creep test shall be performed at the 0.975 FDL test load where movements shall be recorded at 1, 2, 3, 5, 6, and 10 minutes. When the pile top movement between 1 and 10 minutes exceeds 0.04 inches, the 0.975 FDL test load shall be maintained an additional 50 minutes. Movements shall be recorded at 20, 30, 50, and 60 minutes. Dial gauges shall be reset to zero after the initial AL is applied.

The Acceptance criteria for micropile verification load tests are:

- S. If the pile is tested in compression, acceptance will be based on the Davisson criteria. For this criterion, the ultimate load is defined as the load at which settlement measured relative to the top of the pile prior to the start of testing exceeds the sum of:
 - 1. The theoretical elastic compression of the pile assuming the load applied at the top of the pile act over the full length of the pile, and
 - 2. 0.15 inches plus 1 percent of the pile tip diameter.
- T. If the pile is tested in tension, the ultimate load is defined as the load that produces an upward movement under load of 0.5 inch at the pile tip. The movement at the pile tip is:
 - 1. Measured directly by tell-tale, or
 - 2. Computed by deducting the theoretical elastic elongation of the pile from the upward movement measured relative to the top of the pile prior to the start of testing.
- U. At the end of the 0.975 FDL increment, the test pile shall have a creep rate not exceeding 0.04 inch/log cycle time (1 to 10 minutes) or 0.08 inch/log cycle time (6 to 60 minutes or the last log cycle if held longer). The creep rate shall be linear or decreasing throughout the creep load hold period.
- V. Failure does not occur at any load increment up to and including the maximum test load, 1.50 FDL. Failure is defined as load where the slope of the load versus head settlement curve first exceeds 0.025 in/kip.

At the completion of verification testing, test piles shall be removed down to the elevation specified on the plans or by the Engineer.

For the verification load tests, reports must be written and submitted to the Engineer within 3 working days of the load test completion. This report will either confirm the micropiles' resistance and bond lengths specified on the plans or reject the piles based upon the test results. This report shall be reviewed and acceptance by the Engineer prior to beginning installation of production micropiles. The contents of the verification load test report shall include:

- Brief project description.
- Description of site and subsurface conditions including information on the ground conditions at the location of the load test and a comparison to actual conditions encountered.
- Key personnel including the drill rig operator, the superintendent, the grout plant operator, and any other personnel involved in the installation and testing of the micropile.
- Micropile installation data including information such as length of the micropile (cased and uncased), number of bags of cement used to construct the micropile, size and type of casing and reinforcement, geology encountered (e.g. soil material, rock material, and water levels) during drilling, grouting record and grout testing results.
- Results of load test including load-movement curves/figures and filled-out data sheets.
- Statement of load test requirements and acceptance criteria.
- Comparison of load test requirements and acceptance criteria.

- Summary statement on the load test results.

If a tested micropile fails to meet the Acceptance criteria, the Contractor shall modify the design, the construction procedure, or both. These modifications may include but not limited to modifying the installation methods, increasing the bond length, regROUTing the pile via preplaced regROUT tubes or changing the micropile type. Any modification that necessitates changes to the structure design shall be submitted as a revision to the Working Drawings and require the Engineer's review and acceptance. Additional load testing may be required until an acceptable pile load test meets the designated load test requirements.

O. Micropile Proof Test

Proof test piles to a maximum test load of 1.00 FDL as defined above. Proof tests shall be made by incrementally loading the micropile in accordance with the following cyclic load schedule:

Step	Loading	Applied Load	Hold Time (min.)
1	Cycle 1	AL	-
		0.10 FDL	4
		0.20 FDL	4
		0.30 FDL	4
		0.40 FDL	4
		0.50 FDL	4
		0.60 FDL	4
		0.70 FDL	4
		0.80 FDL	4
		0.90 FDL	4
		1.00 FDL	10 or 60 (Creep Test)
		0.75 FDL	4
		0.50 FDL	4
		0.25 FDL	4
		AL	4

Creep Test: Pile top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. The proof test pile shall be monitored for creep at

the 1.00 FDL. Depending on performance, either a 10 minute or 60 minute creep test shall be performed at the 1.00 FDL test load where movements shall be recorded at 1, 2, 3, 5, 6, and 10 minutes. When the pile top movement between 1 and 10 minutes exceeds 0.04 inches, the 1.00 FDL test load shall be maintained an additional 50 minutes. Movements shall be recorded at 20, 30, 50, and 60 minutes. Dial gauges shall be reset to zero after the initial AL is applied.

The Acceptance criteria for Micropile Proof Load Test are the same as those for the Micropile Verification Load Test, except as modified below:

- The creep test shall be held at the end of the 1.00 FDL increment.
- Failure does not occur at any load increment up to and including the maximum test load, 1.00 FDL

Within 3 days of the completion of each proof load, the Contractor shall submit a report confirming the micropiles' capacities and bond lengths specified on the plans or reject the piles based upon the test results. The contents of the proof load test report shall be the same as those in the report for the Micropile Verification Load Test.

If a proof-tested micropile fails to meet the Acceptance criteria, the Contractor shall immediately proof test another micropile within that substructure. For failed piles and further construction of other piles, the Contractor shall modify the construction procedure. Failed micropiles shall be replaced at the Contractor's expense. Any modification that necessitates changes to the structure design shall require the Engineer's prior review and acceptance. Verification and proof tests will be re-performed if the micropile type is changed.

NON-CONFORMING PILES

Non-conforming piles include piles that are installed out of tolerance, are damaged, the volume of grout placed is less than the theoretical volume of the hole, or the grout tests do not indicate the specified strength has been achieved. The Contractor shall submit a written remedial action plan to the Engineer for approval. The remedial action plan shall indicate how to correct the problem and prevent its reoccurrence. To mitigate or remediate non-conforming piles, the Contractor may be required to provide additional piles or supplement piles to meet specified requirements at no additional cost to the Owner.

METHOD OF MEASUREMENT

Drilled Micropiles will be paid for at the contract unit price per Foot.

Micropile Verification Load Test and Micropile Proof Load Test shall be measured for payment per Each. BASIS OF PAYMENT

Drilled Micropiles shall be paid at the contract unit price per Foot, complete in place and accepted. Payment for drilled micropiles shall be considered complete compensation for providing all materials, labor, equipment, proper disposal of drilling spoil, and incidentals to complete the work. There will be no separate measurement for mobilization and demobilization associated with this item. Any difference in the required length of permanent casing and micropile installed and accepted by the Engineer from the estimated lengths shall be measured for payment and/or credit. There will be no payment for differences in required length of temporary casing. The Micropile Contractor is also responsible for estimating the grout take. There will be no extra payment for grout overruns.

The Contractor shall anticipate encountering obstructions as noted herein and shall utilize equipment and methods necessary to advance through or remove the obstructions. The presence of

obstructions, any lost production, replacement piles, and the removal of obstructions, if necessary, shall not be measured or paid for separately. Any costs associated with the presence of obstructions shall be considered incidental to the Drilled Micropiles Item.

Drilling tools that are lost during the drilling shall not be considered obstructions and shall be promptly removed by the Contractor without compensation. If removal will degrade the hole, the hole shall be abandoned with a new hole located by the Engineer. All costs due to lost tool removal, drilling a new hole and filling the abandoned hole shall be borne by the Contractor.

Micropile Verification Load Test and Micropile Proof Load Test shall be paid at the contract unit price per each completed and accepted test, for which payment shall be considered complete compensation for providing all design, materials, labor, equipment, load test report, and incidentals to complete the work including the installation and materials of the test pile and reaction piles, if used. This payment shall also include full compensation for cutting the pile to the elevation necessary to properly incorporate the pile in the structure. If a pile is not to be incorporate in the structure, this payment item includes cutting the pile to the grade necessary to avoid its interference with the proposed construction. Payment for Micropile Verification Load Tests shall also include full compensation for installing the test pile. Micropiles installed as test piles for Proof Load Tests, if incorporated in the final structures, the length of pile installed in place shall be paid for at contract unit price of Drilled Micropiles.

1.1 Payment Items

945.10 Drilled Micropiles.....	Foot
948.60 Micropile Verification Load Test.....	Cubic Yard
948.61 Micropile proof Load Test.....	Cubic Yard

ITEM 950.5**TEMPORARY SUPPORT OF EXCAVATION****SQUARE YARD**

All work under this Item shall conform to the relevant portions of Section 140 and 950 and the following:

The Contractor shall furnish, install, maintain and remove a temporary earth support system as required based upon the actual site conditions, for the maintenance of traffic during the demolition and construction of the existing and proposed bridge foundations. This earth support system shall be designed by the Contractor and shall provide sufficient space to allow for the installation of the temporary traffic barrier system and the required lane widths specified during stage construction.

The temporary earth support system shall consist of sheet piling, soldier piling and lagging, or any other system that satisfies the design criteria contained herein. The temporary earth support system must be capable of supporting all loads applied during each stage for the required depth of excavation in the vicinity of the existing and proposed abutments. The temporary earth support system shall extend longitudinally such that the maximum slope of the excavated surface does not exceed 1 (vertical) to 2 (horizontal). The temporary earth support system must be configured such that it will serve its intended purpose during each stage of construction without the need for reinstallation or major modifications.

All material used for the temporary earth support system shall be sound and free from strength impairing defects. Steel sheeting (if used) shall conform to the applicable requirements of Section 950.

The Contractor shall submit to the Engineer for approval a short-term traffic management plan required for the installation of the temporary earth support system and the Temporary Barriers. The plan submitted shall be sufficiently detailed so that the Contractor's method of dealing with operations shall be clearly stated. No construction work shall be allowed before the Engineer approves this traffic management plan.

The Contractor shall submit to the Engineer for approval a temporary earth support system design that is designed to carry all of the applicable AASHTO loads, including, but not limited to, earth pressure and surcharge due to truck loading and temporary barriers. The temporary earth support system must be designed and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts. Prior to any excavation, the Engineer must approve complete detailed drawings and complete calculations for the temporary earth support system in writing.

The Contractor shall accurately locate all utility lines and structures to ensure that the proposed temporary earth support system will not interfere with any existing utilities and structures.

Measurement for the work to be done under this Item shall per square yard of vertical surface area supported. The payment limits shall be bound by the top of the wearing surface of the adjacent traveled way, the bottom of the required excavation, and the back of the existing abutments.

Payment for the work to be done under this Item shall be at the contract unit price per square yard of vertical surface area supported. Such price shall be considered full compensation for all labor, equipment, materials and tools necessary to accomplish the specified work in a manner satisfactory to the Engineer. Payment shall be made based upon the following percentages: 10% upon approval of design, 60% upon complete installation, and 30% upon removal.

ITEM 983.22**PLACED RIPRAP****CUBIC YARD**

The work under this Item shall conform to the relevant provisions of Section 983 of the Standard Specifications and the following:

The work under this Item includes the placement of Riprap in the vicinity of the proposed abutments and wingwalls in order to protect the abutments and wingwalls from scour, as shown on the Plans, and as directed by the Engineer.

Stone for Riprap shall be placed on the prepared slopes or areas in a manner that will produce a well-graded mass of stone with the minimum practicable percentage of voids and minimum thickness of 24 inches. Riprap protection shall be placed to its full thickness in one operation in such a manner to avoid displacing the underlying material. Placing of Riprap in layers or by dumping into chutes or by placing by similar methods that are likely to cause segregation will not be permitted.

The larger stones shall be well distributed and the entire mass of stone shall conform to the gradation specified under Subsection M2.02.2. All material going into the Riprap protection shall be so placed and distributed that there will be no large accumulations of either the larger or smaller sizes of stone.

It is the intent of this specification to produce compact Riprap aprons and slopes in which all sizes of material are placed in their proper proportions. Hand placing or rearranging of individual stones by mechanical equipment shall be required to the extent necessary to secure the specified results.

Unless otherwise authorized by the Engineer, the Riprap protection shall be placed in conjunction with the reconstruction of the embankment slopes. The lag time between the placement of the Riprap protection and the reconstruction of the embankment slope shall be minimized to prevent mixture of the embankment and Riprap material.

The work to be done under this Item will be measured and paid at the Contract Unit Price per Cubic Yard complete and in place. Said price shall be considered full compensation for all labor, tools, equipment and materials necessary for the completion of the work.

The work to be performed under this Item shall include all pumping, sandbagging, earth support, and other measures, inclusive of optional sheeting, necessary for sufficient water control to accomplish the demolition of the existing structure and the construction of the proposed structure in the dry.

Dewatering shall be conducted to ensure that all structural concrete is placed and cured in the dry. For demolition purposes, dewatering shall be conducted on an as needed basis as determined by the Contractor.

It is the responsibility of the Contractor to determine the need and extent of dewatering required and to submit methods and materials he/she proposes to use for the Engineer's approval.

Construction Methods:

The Contractor shall develop plans and calculations for all sandbagging, dikes, optional sheeting and other water control measures for this Item. These Plans and calculations shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts and shall be submitted for the approval of the Engineer prior to the start of construction.

The Contractor shall use such equipment and shall perform his/her operations in such a manner that boiling or other disturbances of the soil in the foundation area will be prevented. He/She shall keep the area being excavated dry by such means that water will be prevented from entering from the adjacent soils and adversely affecting the stability of the foundation material or supporting soils.

All dewatering and related earthwork shall be conducted in such a manner as to prevent siltation or contamination of the waterway.

The pumping discharge shall not be allowed to enter directly into the Mill Brook. The water from the work areas shall be pumped to a settling tank, one for each abutment. The tank shall be constructed so as to allow for the pumped water to pass through the tank with sediments settling out before outletting to an area enclosed by hay bales. The tank can be constructed of concrete, fiberglass or any other material that will meet the following:

1. Approximately 70 percent sedimentation trapping efficiency shall be achieved with a typical tank to ensure that the tanks are adequately sized to prevent overtopping from dewatering and to provide the required filtering.
2. The outlet from the settling tank shall not cause erosion of the surrounding area. An approved method of controlling erosion, such as an erosion control blanket, stone, etc., shall be used at the outlet of the tank.

The settling tanks shall be maintained as follows:

1. Inspect at least twice daily during dewatering operations.
2. Repair any damage immediately.
3. Clean tank outlet daily. Remove any debris immediately.
4. Remove sediments when deposits reach 8 inches below the outlet invert.
5. Dispose sediments outside of wetland areas at a location approved by the Engineer.

The Contractor shall inspect hay bales that surround the outlet daily and shall immediately replace any that are damaged.

Placement of the tanks will be as directed by the Engineer due to specific site conditions and staging operations of the Contractor.

Pumping shall be conducted in a manner, which will not adversely affect the freshly placed concrete within the excavation.

The Contractor shall provide and maintain ample pumps, pipes and other devices to promptly and continually remove and dispose of water from the excavation areas. The size and configuration of pumps and pipes shall be selected by the Contractor.

Payment for all water control work, including the design of the dewatering system, all necessary equipment, materials and installation, pumping, placement and/or removal of temporary dikes or other retaining structures all as outlined above, shall be included in the Contract Lump Sum Price for this Item.

ITEM 992.33**TEMPORARY SUPPORTS FOR UTILITIES****LUMP SUM**

The work done under this Item shall conform to the applicable portions of Section 901.60 of the Standard Specifications except where specifically amended herein. The work includes the design, erection, and maintenance of a temporary support structure for the existing:

- 10.01 2 – 12" Eversource oil-filled steel pipes containing 345KV cables;
- 10.02 Eversource shall design and install new relocated conduits in a manner that they can be temporarily supported in place during Stage 2 Bridge Construction;
- 10.03 4 – 3 ½" Eversource electric conduits are to be supported in place during demolition and steel erection followed by replacement
- 10.04 4 – 4" steel Verizon conduits and 8 – 4" steel Verizon conduits are to be supported in place during demolition and steel erection, then laterally relocated with additional new conduit after steel erection.

The Contractor shall be responsible for designing and constructing a safe and adequate temporary support system that provides the necessary rigidity and supports the loads imposed by the utilities to remain in place. The support system shall be removed only upon the direction of the Engineer.

The location of the temporary support system shall be so as not to interfere with the demolition of the existing structure and the installation of the structural steel framing and the piles that are to support the proposed abutments.

Included in this Item are all supporting elements needed for the temporary support of the utilities to remain in place and any excavation in the vicinity of the work required for the erection of the support system. The excavation and backfilling shall conform to the relevant provisions of Section 140.

MATERIALS

Materials shall conform to the requirements of the Standard Specifications. Construction materials may include lumber, plywood, steel, and concrete. Dimensional lumber shall be straight and free from defects. Structural steel may be either new or salvaged material, provided that the steel is in excellent condition (free from any significant loss of section). New steel for the support system shall conform to the requirements of AASHTO M270 Grade 36, 50 or 50W (ASTM A709 Grade 36, 50, or 50W), the grade as chosen by the Contractor to suit his design. All steel and welding shall conform to the relevant provisions of Section 960 of the Standard Specifications and as amended herein.

DESIGN

The design of the temporary supports shall be adequate for all loads applied to the temporary structure until these loads may be safely carried by the proposed structure. Loads acting on the support system include self-weight, weight of any bracing, environmental loads (wind, etc.), and all construction live loads.

The Contractor shall submit calculations and detailed drawings of the proposed support system to the Engineer for approval. A Professional Engineer registered in Massachusetts shall stamp these calculations and drawings.

The allowable design stresses shall be in accordance with the AASHTO Standard Specification for Highway Bridges. Unless sufficiently documented to the contrary, all salvaged steel used in the support system shall assume a maximum yield stress of 30 ksi, with the various allowable stresses determined in accordance with the applicable AASHTO criteria. Other governing criteria, including

permissible deflections for each utility under environmental loading shall be determined by the utility owner.

CONSTRUCTION

The ground at locations adjacent to the existing abutments may support the support structure. The ground must be thoroughly compacted so that the potential for settlement will be minimized. The Contractor is advised that the supports shall not be located within the limits of the Mill Brook since none of the required permits for such work have been obtained.

All welding and the preparation and assembly of materials for welding shall conform to the relevant provisions of the Standard Specifications for Highways and Bridges, the current edition as of the bid opening date of the AASHTO Standard Specifications for Highway Bridges and the AASHTO/AWS Bridge Welding Code (ANSI/AASHTO/AWS D1.5).

The Contractor's methods shall not damage any retained structural elements of the existing structure. Any damage done to the retained portions of the existing structure as a result of the Contractor's operations shall be repaired to the satisfaction of the Engineer at the Contractor's expense.

All temporary materials used in the support system shall become the property of the Contractor and shall be removed from the site at the completion of the project. Supports shall be installed or removed only upon the approval of the Engineer.

Upon completion of all work under this Item, the Contractor shall remove the entire support system including the temporary foundations for the supports.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The work done under this Item shall be paid as a lump sum and shall be considered full compensation for the temporary utility support installation and removal, including all necessary labor, material, equipment, and tools to complete the work.

ITEM 995.01**BRIDGE STRUCTURE, BRIDGE NO. A-10-015****LUMP SUM**

The work to be done under this Item shall conform to the applicable provisions of Section 901 and Section 995 of the Standard Specifications and the specific requirements stipulated below for the component parts of this Item.

Work under this Item shall include all materials, equipment and labor needed to construct the following components of the bridge: the reinforced concrete pile caps, integral diaphragm, steel framing (beams, diaphragms, and utility supports), reinforced concrete deck slab and sidewalks, concrete safety curb and steel bridge railing, and sealing the bridge deck. Materials shown on the plans as being part of this bridge structure or incidental to its construction shall be included for payment in this Lump Sum and shall not be included for payment under another Item in this contract.

5000 PSI, ¾ IN., 685 HP CEMENT CONCRETE

5000 PSI, ¾ IN., 685 HP Cement Concrete shall be used to construct the sidewalks and end posts. 5000 PSI, ¾ IN., 685 HP Cement Concrete shall conform to all material and placement, finishing, and curing requirements of the Supplemental Specifications, with the exception of the cementitious content which shall be limited to a maximum of 685 pounds per cubic yard.

4000 PSI, ¾ IN., 585 HP CEMENT CONCRETE

4000 PSI, ¾ IN., 585 HP Cement Concrete shall be used to construct the pile caps, concrete topping slabs, bridge deck, haunches, and beam end encasement. 4000 PSI, ¾ IN., 585 HP Cement Concrete shall conform to all material and placement, finishing, and curing requirements of the Supplemental Specifications, with the exception of the cementitious content which shall be limited to a maximum of 585 pounds per cubic yard.

HOT DIP GALVANIZED COATING FOR NEW STRUCTURAL STEEL**A. GENERAL**

Fabricated steel shall be galvanized as indicated on the plans. All fabrication shall be completed prior to surface preparation and the application of any coating.

The faying surfaces of all field bolted connections shall be coated based on the design of the connection. Class B connections shall be masked prior to galvanizing to allow for application of an approved class B slip coefficient primer. After galvanizing the masked surface will be cleaned in accordance with SSPC- SP11 and coated with the approved zinc rich primer. A galvanized connection will result in a faying surface meeting a class C slip coefficient.

When grinding, drilling or any other operation produces steel turnings, filings, shavings, etc. the contractor shall completely clean all areas of all accumulation prior to the end of the work shift.

Locations of field applied studs shall require masking or removal of galvanizing and paint prior to welding.

The Engineer shall provisionally accept the shop coated items before shipment to the jobsite but final acceptance of the coating system will occur after erection of the coated items, and after all required repairs and coating application has been completed.

The contractor shall be responsible for failure and damage of all applied coating. Failures include but are not limited to, visible corrosion, blistering, checking, cracking, or delamination (peeling) and loss of gloss and color of the coating system. Damage includes but is not limited to damage from installation or from external agents, such as scraping, vandalism, debris impacts, and collisions. The extent and

method of repair must be approved by the Engineer.

B. GALVANIZING

The following shall be hot dipped galvanized in accordance with Section M7 of these Specifications:

1. Members identified on the contract documents.
2. Diaphragms and utility supports.

Galvanized members requiring shop fabrication and assembly shall be cut, welded, and/or drilled prior to galvanizing. Bearing members to be milled shall be galvanized prior to milling. A thin layer of a rust inhibitor shall be applied to the milled surface. Material to be painted shall not be quenched after galvanizing.

Where material is required to be welded after galvanizing, the steel shall be masked 3 inches on each side of the weld center line. Prior to field welding the masked surface shall be cleaned in accordance with SSPC- SP11. After welding the area shall be repaired in accordance with ASTM A780 "Repair of Hot Dip Galvanizing" section 4.2.2, "Paints Containing Zinc Dust" and Annex 2. Repair paint shall meet M7.04.11 and application shall be in accordance with the manufacturer's recommendations.

Damaged galvanized surfaces shall be repaired in accordance with ASTM A780 "Repair of Hot Dip Galvanizing" section 4.2.2 Paints Containing Zinc Dust "High Zinc Dust Content". The paint shall be applied to achieve a minimum dry film thickness of 3 mils and not more than 5 mils. Repair paint shall meet M7.04.11 and application shall be in accordance with the manufacturer's recommendations.

The contractor shall provide protection of the adjacent coating in areas that will be field welded. After welding, the weld areas shall be prepared in accordance with SSPC-SP-11.

EXPOSED CONCRETE BRIDGE DECK SEALING

This work shall consist of preparing and treating the concrete wearing surfaces of bridge decks with a penetrating sealer-HMWM Resin (HIGH MOLECULAR WEIGHT METHACRYLATE) in accordance with these specifications, in close conformity with the manufacturer's recommendations, and as directed by the Engineer.

MATERIALS

Methacrylate crack sealer shall consist of a high molecular weight low viscosity methacrylate monomer that when catalyzed will produce a crack-healer/penetrating-sealer that is a rapid-curing, modified-methacrylate resin. The methacrylate material shall, as a minimum, provide the following as applied properties:

Property	Value	Test
Viscosity	< 25 cps	ASTM D2393
Bond Strength	> 1500 psi	ASTM C882
Tensile Elongation	> 3%	ASTM D638

Sand applied to the treated deck surface shall conform to M1.04.0 and the following gradation requirement:

Sieve Size	% Passing Max.
No. 4	100
No. 8	90-100
No. 20	5-15
No. 50	0-5

CONSTRUCTION

D. Limitations. This work shall not be performed during the period beginning November 1st and ending March 31st.

E. Surface Preparation. Roadway dirt and debris shall be removed from the area of the deck to be treated. Areas to be treated shall be swept, abrasively shot-blasted, then, with the use of a manual or power broom sweep, blown clean and dry with compressed air so that the surfaces to which the sealer are to be applied are dry and free of dust and dirt. High pressure compressed air shall be used to blow all loose material from visible cracks. The cleaning equipment shall be fit with suitable traps, filters, drip pans, driers and other devices to prevent oil and other foreign material from being deposited on the surface. No traffic shall be allowed on the clean surface of the deck prior to application of the sealer. All existing pavement markings shall be removed. All traces of asphalt or petroleum products and concrete curing seals shall be removed by abrasive blasting prior to air sweeping.

F. Installation. A technical representative shall be on site to provide mixing proportions equipment suitability, and safety advice. Any conflict between these provisions and representative's advice shall be resolved at the job site. The technical representative shall remain at the job site until such time as he and the Engineer agree that the Contractor is qualified in all aspects of the application of the sealer.

The promoter and initiator, if supplied separate from the resin, shall not be allowed to contact each other directly. Do not store containers of promoter or initiators together in a manner that will allow leakage or spillage from one to contact the containers or materials of the other.

Machine application of the resin may be performed by using a two-part resin system utilizing a promoted resin for one part and an initiated resin for the other part. This two-part resin system may be combined at a spray bar through positive displacement atomization of the resin. Compressed air shall not be used to produce the spray.

Cleaning and flushing of equipment, tools, etc., with an appropriate solvent, as approved by the Engineer, shall be performed in such a manner to minimize personal and environmental hazards. Workers shall be advised that the resin will soften gum rubber soles, and a face-mask should be used to protect from accidental splashes. Clothing and leather saturated with resin will harden and become useless.

Prior to resin application the surface to be treated shall be visibly dry and its temperature shall range between 50°F and 120°F. The resin shall not be applied within 24 hours after rain has fallen on the bridge deck or when rain is forecast within 12 hours or when the ambient air temperature is below 50°F. The deck shall be pre-marked to control mixed material usage and to provide a rate of application of

approximately 100 square feet per gallon. The exact rate shall be determined by the Engineer prior to commencing full- scale deck treatment operations.

Before using the material, the manufacturer certified test data shall be submitted to the Engineer showing that the material complies with the requirements of this specification. The test data shall be developed by an independent approved testing laboratory, and shall include the brand name of the material, name of manufacturer, number of the lot tested and date of manufacture. When the material has been approved by the Engineer, further testing by the manufacturer will not be required unless the formulation of manufacturing process has been changed, in which case new certified test results will be required. The manufacturer shall certify that the formulation is the same as that for which data has been submitted. The Engineer reserves the right to sample and test delivered lots for compliance.

If the surface contains large deep cracks, the low-viscosity sealer could run completely through the concrete slab. Cracks over 1/8" shall be treated individually prior to deck application. Wider cracks shall be filled with dry, 30 mesh silica sand and the sealer shall be poured into cracks and distributed with a paint brush or squeeze bottles.

The deck surfaces shall be flooded with resin, allowing penetration into the concrete and filling of all cracks. The volume of initiated mix of promoted resin shall be limited to 5 gallons at a time for manual application. A significant increase in viscosity shall be cause for rejection. The treatment shall be applied within 5 minutes after complete mixing. Excess material shall be redistributed by squeegee or brooms within 10 minutes after application.

All necessary steps shall be taken to prevent the resin from flowing into lanes open to traffic. Sand shall be broadcast over the entire treated area of the bridge deck by mechanical means to affect a uniform coverage of 0.80 to 1.2 pounds per square yard. It is the intention of this specification to allow the use of commercially available blast sands applied by a common lawn broadcast type seeder/spreader. Sand shall be placed between 10 to 15 minutes behind the resin spreading front and before any jelling of the resin occurs. Apply a second coat in these areas after the first coat has started to cure.

No traffic or equipment shall be permitted on the treated deck until it is tack free and a minimum of 6 hours have elapsed since treatment and the sand cover adheres sufficiently to resist brushing by hand. The treated deck areas shall be protected from moisture for not less than 4 hours after placement.

SCHEDULE OF BASIS FOR PARTIAL PAYMENT

The Contractor shall submit a schedule of unit prices for the major component Sub-Items that make up Item 995.01 as well as the total Bridge Structure Lump Sum cost. The Bridge Structure Lump Sum breakdown quantities provided in the proposal form are estimated and not guaranteed. The total of all partial payments to the Contractor shall equal the Lump Sum contract price regardless of the accuracy of the quantities furnished by the Engineer for the individual bridge components. The cost of labor and materials for any Item not listed but required to complete the work shall be considered incidental to Item 995.01 and no further compensation will be allowed.

The schedule on the proposal form applies only to Bridge Structure No. A-10-015. Payment for similar materials and construction at locations other than at this bridge structure shall not be included under this Item. Sub-Item numbering is presented for information only in coordination with MassDOT Standard Nomenclature.

995.01 **Bridge No. A-10-015**

<u>Sub-Item</u>	<u>Description</u>	<u>QTY.</u>	<u>UNIT</u>	<u>PRICE</u>	<u>TOTAL</u>
901.	4000 PSI, 1 1/2 IN., 565 CEMENT CONCRETE	45	CY		
904.3	4000 PSI, 3/4 IN., 585 HP CEMENT CONCRETE	120	CY		
904.4	5000 PSI, 3/4 IN., 685 HP CEMENT CONCRETE	16	CY		
910.1	STEEL REINFORCEMENT FOR STRUCTURES – EPOXY COATED	29000	LB		
960.13	STRUCTURAL STEEL – HOT DIPPED GALVANIZED	33200	LB		
960.11	STRUCTURAL STEEL – UNCOATED	800	LB		
908.11	EXPOSED CONCRETE BRIDGE DECK SEALING	1720	SF		
975.1	METAL BRIDGE RAILING (3 RAIL), STEEL (TYPE S3-TL4)	60	FT		

TOTAL LUMP SUM FOR ITEM 995.01 =

LIST OF APPENDICES

APPENDIX A: Bridge Design Plans

APPENDIX B: Geotechnical Report

APPENDIX C: Hydraulic Design Report

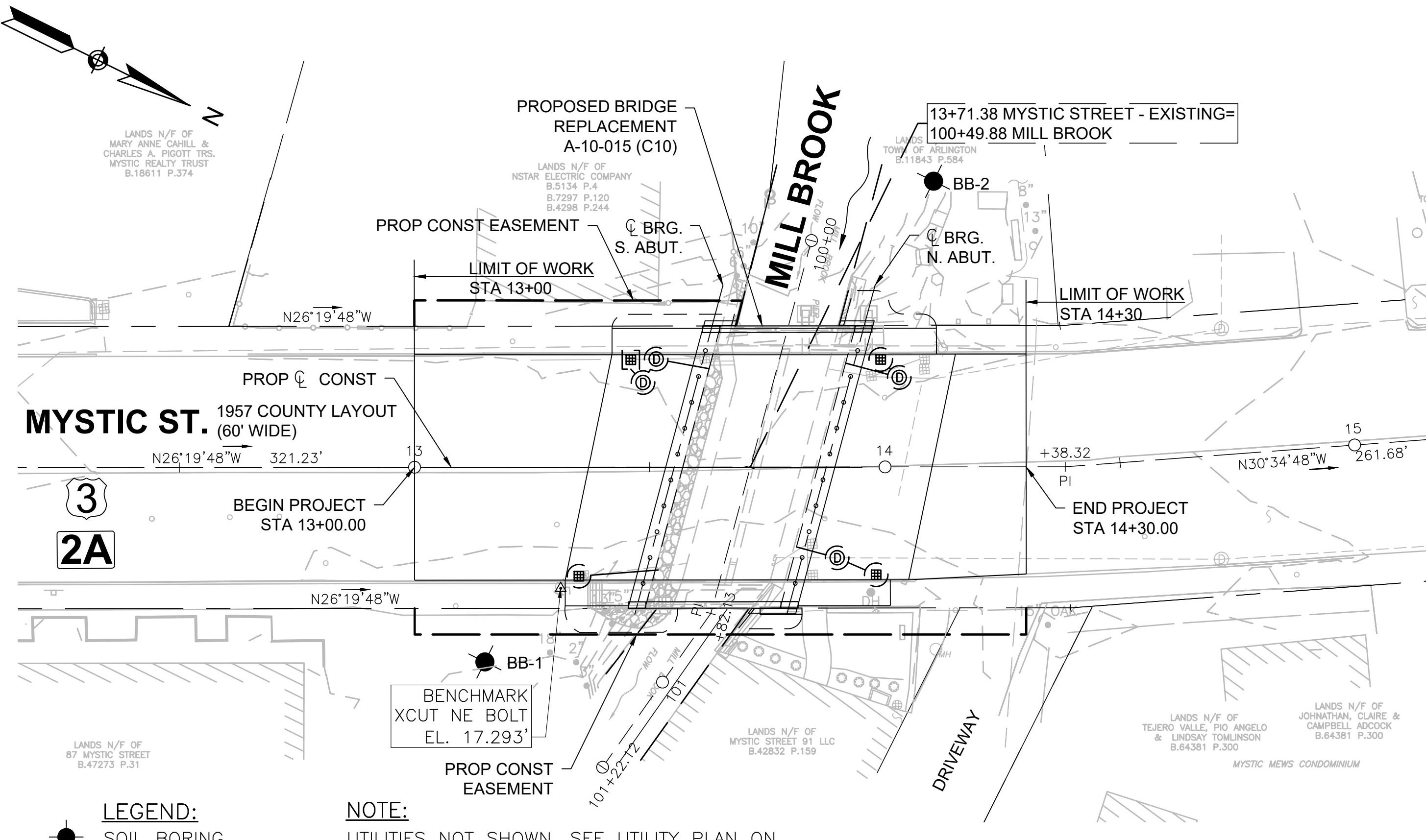
APPENDIX D: MassDOT Bridge Inspection Reports

APPENDIX E: Order of Conditions with Resource Area Plan

APPENDIX F: MWRA 8M Permit

APPENDIX G: Miscellaneous Documents

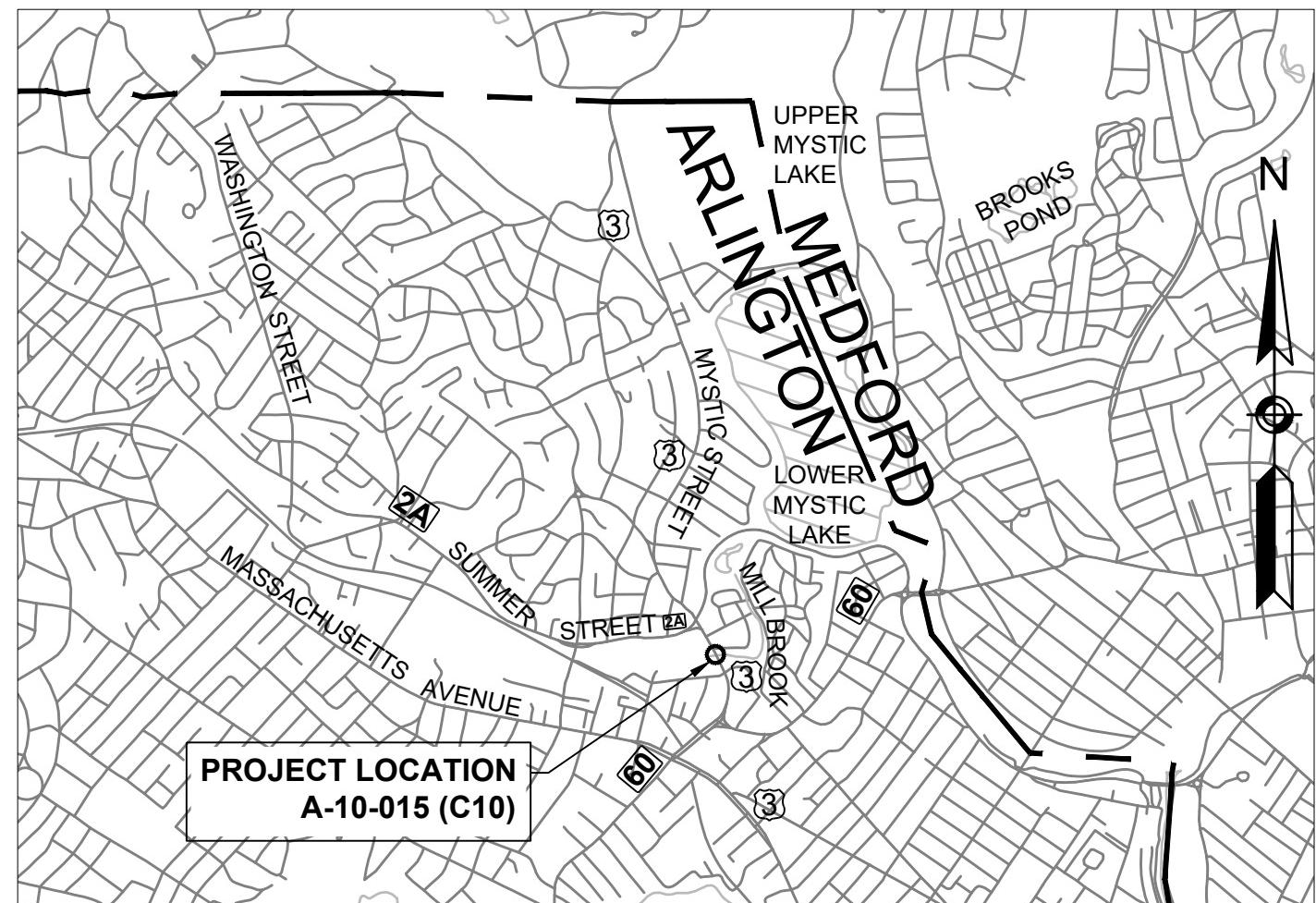
APPENDIX A: Bridge Design Plans



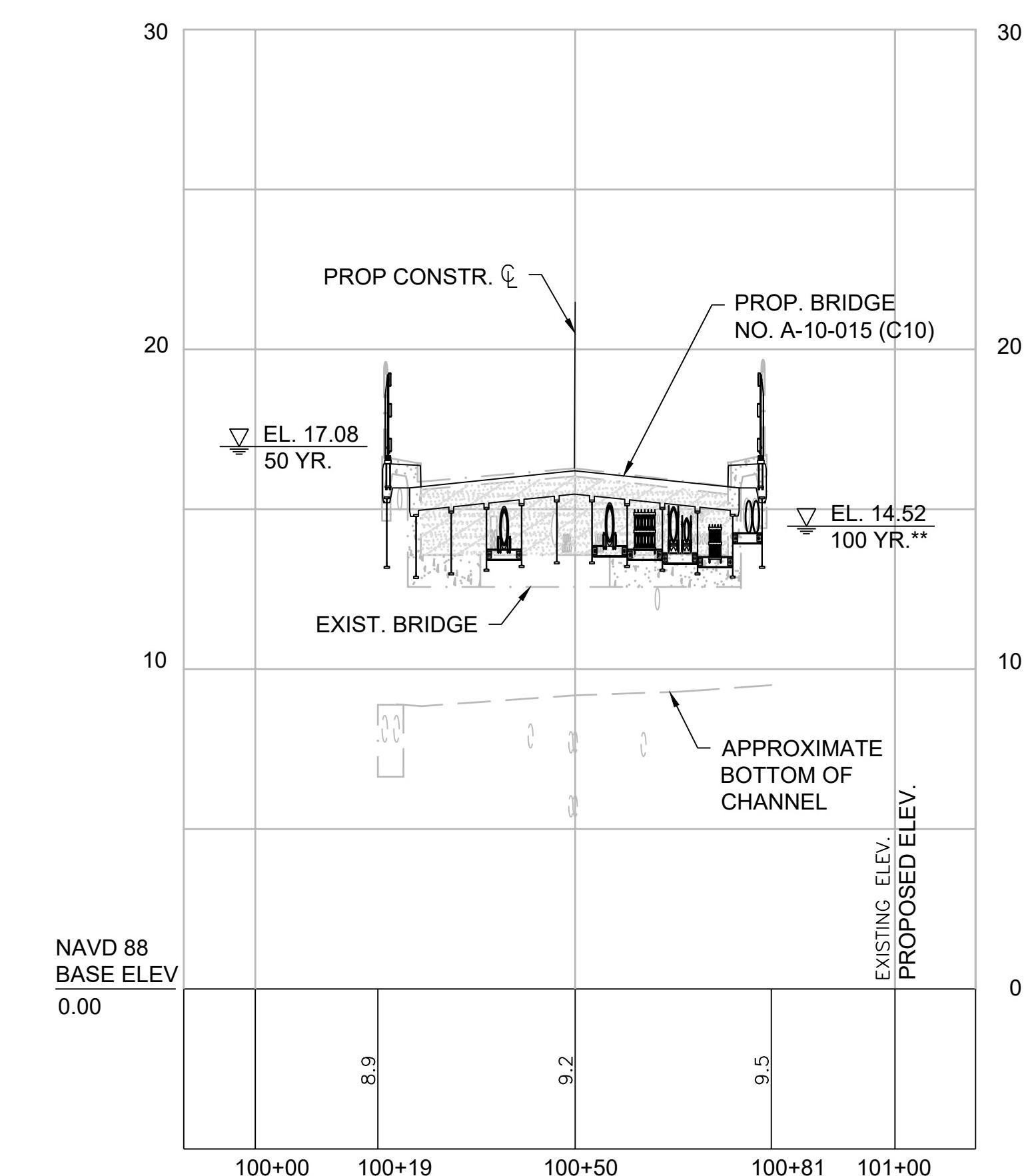
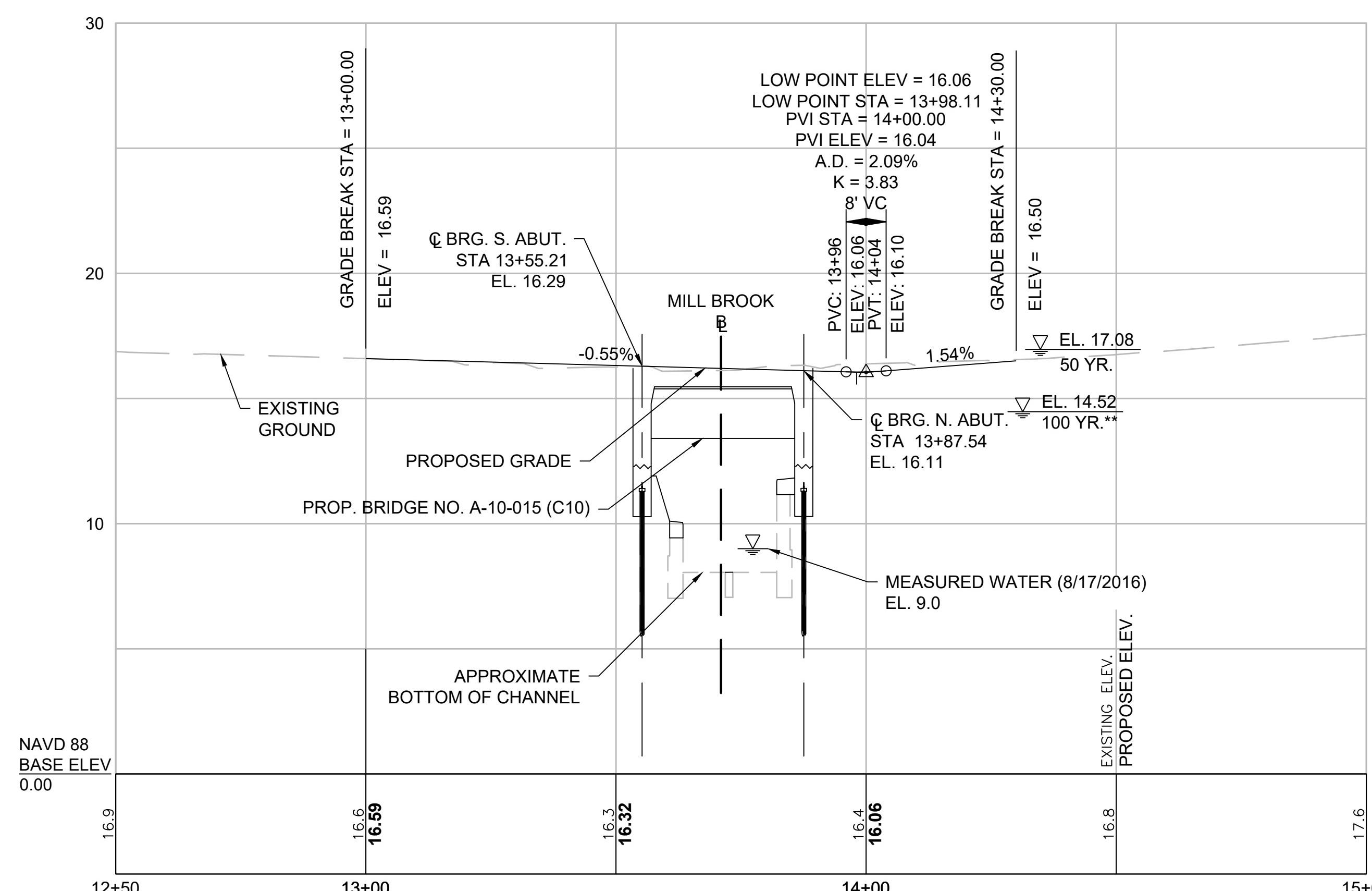
INDEX OF DRAWINGS

SHEET NO. SHEET TITLE

- 1 TITLE SHEET
- 2 GENERAL NOTES
- 3 BORINGS
- 4 GENERAL PLAN & LONGITUDINAL SECTION
- 5 CONSTRUCTION STAGING PLAN
- 6 CONSTRUCTION STAGING
- 7 DEMOLITION DETAILS
- 8 FOUNDATION PLAN & MICROPILE DETAILS
- 9 SOUTH ABUTMENT
- 10 NORTH ABUTMENT
- 11 ABUTMENT DETAILS (1 OF 2)
- 12 ABUTMENT DETAILS (2 OF 2)
- 13 CROSS SECTIONS
- 14 FRAMING PLAN
- 15 STEEL DETAILS
- 16 DECK DETAILS
- 17 S3-TL4 BRIDGE RAILING
- 18 END POST DETAILS
- 19 ROADWAY PLAN & TYPICAL SECTION
- 20 CURBTIE, GRADING & DRAINAGE PLAN
- 21 UTILITY PLAN
- 22 EXISTING UTILITY PLAN
- 23 PROPOSED UTILITY PLAN
- 24 ADVANCE WARNING SIGN PLAN
- 25 TEMPORARY TRAFFIC CONTROL PLAN



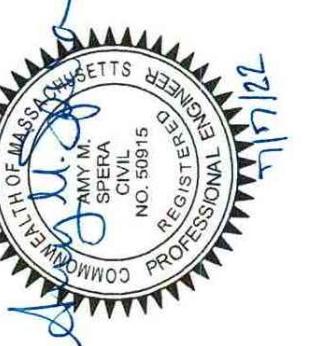
SCALE: 1" = 2000'



63 KENDRICK STREET
NEEDHAM, MA 02494
781-355-7100
781-355-7101 (FAX)

GILL
ENGINEERING

DATE _____
REGISTERED PROFESSIONAL ENGINEER _____



BRIDGE REPLACEMENT
TOWN OF ARLINGTON
PROPOSED BRIDGE REPLACEMENT
A-10-015 (C10)
US3 (MYSTIC STREET) OVER MILL BROOK

TITLE
SHEET

SHEET 1 OF
25

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
APPROVED UNDER PROVISIONS OF
MASS. GEN. LAWS CH 85 § 35
Signature
BRIDGE ENGINEER DATE

GENERAL NOTES:

DESIGN:

IN ACCORDANCE WITH THE 2017 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2018, FOR HL-93 LOADING.

MASSDOT BENCH MARK:

ALL ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

X CUT NE BOLT 1420
NORTHING : 297770.777
EASTING: 750334.732
ELEVATION: 17.29

EXISTING PLANS:

PLANS FOR THE EXISTING BRIDGE ARE AVAILABLE THROUGH THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PLANS AND RECORDS ROOM, 10 PARK PLAZA, BOSTON, MA.

DATE:

TO BE PLACED ON THE INSIDE FACE OF THE NORTHWEST AND SOUTHEAST HIGHWAY GUARDRAIL TRANSITIONS, A SHEET SHOWING SIZE AND CHARACTER OF NUMERALS WILL BE FURNISHED. THE DATE USED SHALL BE THE LATEST YEAR OF CONTRACT COMPLETION AS OF THE DATE THE FIRST HIGHWAY GUARDRAIL TRANSITION IS CONSTRUCTED. BOTH HIGHWAY GUARDRAIL TRANSITIONS SHALL FEATURE THE SAME DATE.

REPORTS:

SEE GEOTECHNICAL REPORT DATED DECEMBER 2017.
SEE HYDRAULIC REPORT DATED DECEMBER 2017.

EXISTING CONDITIONS:

EXISTING DIMENSIONS ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND VERIFY ALL PRESENT DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ADEQUACY AND ACCURACY THEREOF, AND SHALL NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE/SHE HAS MADE THE REQUIRED MEASUREMENTS, AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER.

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES. THE CONTRACTOR SHALL COORDINATE AND COOPERATE WITH THE RESPECTIVE UTILITY OWNERS FOR ALL UTILITIES TO BE PERMANENTLY RELOCATED.

SURVEY:

FIELD SURVEY PERFORMED BY WESTON & SAMPSON FROM ON 8/17/2016. COPIES OF ELECTRONIC FILES MAY BE OBTAINED FROM GILL ENGINEERING ASSOCIATES.

SCALES:

SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS. DIVIDE SCALES BY 2 FOR HALF-SIZE PRINTS.

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

CONCRETE:

4000 PSI, $\frac{3}{4}$ IN., 585 HP CEMENT CONCRETE DECK, ABUT. DIAPHRAGMS, ABUT. PILE CAPS, TOPPING SLABS

5000 PSI, $\frac{3}{4}$ IN., 685 HP CEMENT CONCRETE SIDEWALKS, END POSTS

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M31 GRADE 60. UNLESS OTHERWISE NOTE ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE COATED AND LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. COATED BARS, COVER < 3db, OR CLEAR SPACING < 6db	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2 AND 3	26"	32"	39"
6. CONDITION 2 AND 4	24"	30"	36"

ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

STRUCTURAL STEEL:

ALL STRUCTURAL STEEL MEMBERS SHALL BE AASHTO M270 GRADE 50, HOT DIPPED GALVANIZED, FASCIA GIRDERS TO BE HOT DIPPED GALVANIZED AND PAINTED, COLOR NUMBER 14223, GREEN OF THE FEDERAL STANDARD 595B. ALL BOLTS SHALL BE ASTM F3125 GRADE A325 TYPE I MECHANICALLY GALVANIZED IN ACCORDANCE WITH AASHTO M298 (ASTM B695) CLASS 50. UNLESS OTHERWISE NOTED, NUTS AND WASHERS SHALL BE LISTED AS SUITABLE IN THE ASTM F3125 SPECIFICATION FOR GRADE A325. NUTS SHALL BE MECHANICALLY GALVANIZED BY THE SAME PROCESS AND SHALL BE LUBRICATED WITH LUBRICANT CONTAINING VISIBLE DYE. BOLTS, NUTS, AND WASHERS SHALL BE FIELD PAINTED AFTER INSTALLATION.

PLAN REVISION:

IF THERE ARE REVISIONS TO THE APPROVED PLANS, THE CONTRACTOR SHALL SUBMIT THESE CHANGES TO THE ENGINEER OF RECORD FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION. ONCE THESE REVISIONS ARE APPROVED BY THE MUNICIPALITY'S DESIGNER OF RECORD, AS-BUILT PLANS SHALL BE SUBMITTED TO MASSDOT.

HYDRAULIC DESIGN DATA	
DRAINAGE AREA:	5.05 SQ. MILES
DESIGN FLOOD DISCHARGE:	750 C.F.S
DESIGN FLOOD FREQUENCY:	50 YEARS
DESIGN FLOOD VELOCITY:	3.27 F.P.S.
DESIGN FLOOD ELEVATION:	17.08 FEET, NAVD
BASE (100-YEAR) FLOOD DATA	
BASE FLOOD DISCHARGE:	450 C.F.S
BASE FLOOD ELEVATION:	14.52 FEET, NAVD
DESIGN AND CHECK SCOUR DATA	
DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY:	100 YEARS
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY:	200 YEARS
FLOOD OF RECORD	
DISCHARGE:	UNKNOWN
FREQUENCY (IF KNOWN):	UNKNOWN
MAXIMUM ELEVATION:	UNKNOWN
DATE:	UNKNOWN
HISTORY OF ICE FLOES:	NONE DOCUMENTED IN NBIS DATABASE
EVIDENCE OF SCOUR AND EROSION:	NONE DOCUMENTED IN NBIS DATABASE

**THE 100-YR BASE FLOOD DATA IS FROM THE FEMA FIS

SEISMIC DESIGN CRITERIA	
DESIGN RETURN PERIOD:	2500
DESIGN SPECTRA	
As	0.13G
SDs	0.27G
SD1	0.08G
SITE CLASS	D
SEISMIC DESIGN CATEGORY (SDC)	A

ABBREVIATIONS

ABAN	ABANDON
BO	BY OTHERS
CB	CATCH BASIN
CI	CAST IRON
DI	DROP INLET
DIP	DUCTILE IRON PIPE
DMH	DRAINAGE MANHOLE
FRE	FIBERGLASS REINFORCED EPOXY
EOC	EDGE OF CHANNEL
GI	GUTTER INLET
PROT	PROTECT
RCP	REINFORCED CONCRETE PIPE
REM	REMOVE
RET	RETAIN
TYP	TYPICAL

NO.	QUANTITIES		
	ITEM	UNIT	QUANTITY
115.1	DEMOLITION OF BRIDGE NO. A-10-015	LS	1
120.	EARTH EXCAVATION	CY	110
140.	BRIDGE EXCAVATION	CY	405
141.	CLASS A TRENCH EXCAVATION	CY	25
142.	CLASS B TRENCH EXCAVATION	CY	32
144.	CLASS B ROCK EXCAVATION	CY	5
151.	GRAVEL BORROW	CY	55
151.1	GRAVEL BORROW FOR BRIDGE FOUNDATION	CY	85
156.	CRUSHED STONE	TON	5
170.	FINE GRADING AND COMPACTING – SUBGRADE AREA	SY	55
201.	CATCH BASIN	EA	4
202.	MANHOLE	EA	3
204.	GUTTER INLET	EA	1
221.	FRAME AND COVER	EA	4
222.1	FRAME AND GRATE – MASSDOT CASCADE TYPE	EA	4
224.12	12 INCH HOOD	EA	4
238.10	10 INCH DUCTILE IRON PIPE	FT	15
238.15	15 INCH DUCTILE IRON PIPE	FT	25
241.12	12 INCH REINFORCED CONCRETE PIPE	FT	7
303.08	8 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT)	FT	–
309.	DUCTILE IRON FITTINGS FOR WATER PIPE	LB	–
373.08	8 INCH WATER PIPE INSULATION	FT	–
402.	DENSE GRADED CRUSHED STONE FOR SUB-BASE	CY	25
415.1	PAVEMENT STANDARD MILLING	SY	305
440.	CALCIUM CHLORIDE FOR ROADWAY DUST CONTROL	LB	915
443.	WATER FOR ROADWAY DUST CONTROL	MCL	10
451.	HMA FOR PATCHING	TON	5
452.	ASPHALT EMULSION FOR TACK COAT	GAL	65
453.	HMA JOINT SEALANT	FT	325
460.22	SUPERPAVE SURFACE COURSE – 9.5 (SSC – 9.5)	TON	45
460.32	SUPERPAVE INTERMEDIATE COURSE – 19.0 (SIC 19.0)	TON	30
460.42	SUPERPAVE BASE COURSE – 37.5 (SBC 37.5)	TON	55
472.	TEMPORARY ASPHALT PATCHING	TON	5
482.4	SAWCUTTING PORTLAND CEMENT CONCRETE	FT	45
504.	GRANITE CURB TYPE VA4 – STRAIGHT	FT	130
581.	CURB INLET REMOVED AND RESET	EA	4
701.	CEMENT CONCRETE SIDEWALK	SY	45
748.	MOBILIZATION	LS	1
751.	LOAM BORROW	CY	5
765.	SEEDING	SY	30
852.	SAFETY SIGNING FOR TRAFFIC MANAGEMENT	SF	320
853.1	PORTABLE BREAKAWAY BARRICADE TYPE III	EA	2
853.2	TEMPORARY BARRIER (TL-2)	FT	180
853.21	TEMPORARY BARRIER REMOVED AND RESET	FT	290
853.501	TEMPORARY IMPACT ATTENUATOR REMOVED AND RESET	EA	4
853.72	TEMPORARY IMPACT ATTENUATOR BI-DIRECTIONAL, NON-REDIRECTIVE (TL-2)	EA	2
854.036	TEMPORARY PAVING MARKINGS – 6 INCH (TAPE)	FT	2155
854.1	PAVEMENT MARKING REMOVAL	SF	75
859.	REFLECTORIZED DRUM	DAY	1020
866.106	6 INCH REFLECTORIZED WHITE LINE (THERMOPLASTIC)	FT	930
867.106	6 INCH REFLECTORIZED YELLOW LINE (THERMOPLASTIC)	FT	360
948.60	MICROPILE VERIFICATION LOAD TEST	EA	1
948.61	MICROPILE PROOF LOAD TEST	EA	2
945.10	DRILLED MICROPILES	FT	740
950.5	TEMPORARY SUPPORT OF EXCAVATION	SF	1000
983.22	PLACED RIPRAP	CY	395
991.1	CONTROL OF WATER – STRUCTURE NO. A-10-015	LS	1
992.33	TEMPORARY SUPPORT OF UTILITIES	LS	1
995.01	BRIDGE STRUCTURE, BRIDGE NO. A-10-015	LS	1

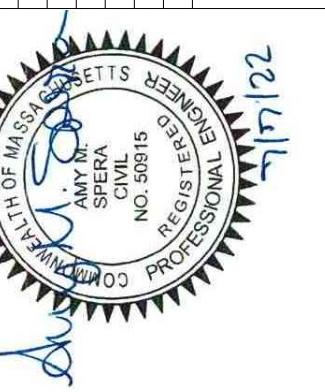
BRIDGE REPLACEMENT	TOWN OF ARLINGTON
PROPOSED BRIDGE REPLACEMENT	A-10-015 (C10) US3 (MYSTIC STREET) OVER MILL BROOK

GENERAL NOTES
COMMONWEALTH OF MASSACHUSETTS MassDOT, Highway Division APPROVED UNDER PROVISIONS OF MASS. GEN. LAWS CH 85 § 35 8/1/2022
BRIDGE ENGINEER
SHEET 2 OF 25

63 KENDRICK STREET NEEDHAM, MA 02494 781-355-7100 (FAX)

**63 KENDRICK STREET
NEEDHAM, MA 02494
781-355-7100
781-355-7101 (FAX)**

The logo features the word "GILL" in a large, bold, black sans-serif font, with a thick diagonal slash through it. To the right of the slash, the word "ENGINEERING" is written vertically in a smaller, bold, black sans-serif font.



BRIDGE REPLACEMENT
TOWN OF ARLINGTON
PROPOSED BRIDGE REPLACEMENT
A-10-015 (XXXX)
US3 (MYSTIC STREET) OVER MILL BROOK

BOTTOM OF PRO
SOUTH ABUTMENT
EL. 10.3

EST. PILE
EL. -26.

Geologic - Earth Exploration, Inc.					CLIENT: Gill Engineering, Inc.	BORING #:	
					PROJECT: 91 Mystic Street	B-1	
					LOCATION: Arlington, MA	PAGE	
7 Sherwood Drive TEL 508 384 4434		Norfolk, MA 02056 FAX 508 384 4452				1 OF 1	
File #:	17143	CASING	SAMPLER	CORE BARREL	Surface Elevation:		
Date Started:	8/28/17	TYPE	HW	SS	Station:		
Date Completed:	8/29/17	SIZE	4"	2 3/8"	Groundwater level readings		
Driller:	P.Fisher	HAMMER	300#	140#	Date	Depth N/O	
Site Rep.:		FALL	30"	30"	Date	Depth	
Depth ft	Sample				Sample Description		
	No.	Depth ft	Pen. in	Rec. in			Blows/6"
	S-1	0.0-2.0	24	12	2-2-2-2	S-1 Dry loose brown fine to medium SAND and GRAVEL	
	S-2	4.0-6.0	24	6	2-2-2-2	S-2 Moist loose brown medium to coarse SAND and GRAVEL, some fine Sand	
10	S-3	9.0-11.0	24	1	18-12-10-10	S-3 Moist medium dense gray to brown fine to coarse GRAVEL	
	S-4	14.0-16.0	24	2	15-5-5-4	S-4 Moist medium dense dark gray fine to coarse GRAVEL, some Sand	
20	S-5	19.0-21.0	24	1	9-4-9-8	S-5 Moist medium dense gray fine to medium GRAVEL, trace Sand	
	S-6	24.0-26.0	24	12	11-10-6-4	S-6 Moist medium dense gray fine SAND, trace of Silt and Gravel	
30	S-7	29.0-31.0	24	6	16-16-12-11	S-7 Similar to S-6	
	S-8	34.0-36.0	24	6	14-10-9-10	S-8 Similar to S-6	
40	S-9	39.0-41.0	24	8	13-8-7-8	S-9 Moist medium dense gray fine SAND and GRAVEL, some fine to coarse Sand	
	S-10	44.0-46.0	24	6	11-13-6-9	S-10 Similar to S-9	
50	S-11	49.0-51.0	24	4	9-6-5-8	S-11 Moist medium dense fine to coarse SAND and GRAVEL, little fine Sand	
	S-12	54.0-56.0	24	8	7-14-10-13	S-12 Moist medium dense gray GRAVEL and fine to coarse SAND	
60	S-13	59.0-61.0	24	8	15-9-10-12	S-13 Moist medium dense gray fine to coarse SAND, little Gravel	
						Bottom of exploration at 61.0' -0'-41' DONUT HAMMER USED -41'-56' AUTOMATIC HAMMER USED	
Ground Surface to _____ used _____ then _____							
Proportions Used		Cohesive Consistency Blows/ft			Cohesionless Density Blows/ft		Sample Type
Trace	0 to 10%	0-2	Very Soft	9-15	Stiff	0-10	Loose
Little	10 to 20%	3-4	Soft	16-30	V-Stiff	10-30	M-Dense
Some	20 to 35%	5-8	M-Stiff	31+	Hard	30-50	Dense
And	35 to 50%					50+	V-Dense
Notes:	1. The stratification lines represent the approximate boundary between soil types. The transition may be gradual. 2. Water level readings were made in the drill hole during or at the completion of drilling. The water level may fluctuate over time.						
Remarks:	NOTE: All soil descriptions are made in the field by the Drilling Foreman. No laboratory analyses were performed for this purpose.						

NOTE:
APPROXIMATE LOCATION OF BB-1
GROUND SURFACE EL. 15.0
STA 13+14.9, OFFSET 41.33' RT

Geologic - Earth Exploration, Inc.					CLIENT: Gill Engineering, Inc.	BORING B-2	
7 Sherwood Drive TEL 508 384 4434		Norfolk, MA 02056 FAX 508 384 4452		PROJECT: 91 Mystic Street			
				LOCATION: Arlington, MA			
File #: 17143		CASING TYPE HW	SAMPLER SS	CORE BARREL	Surface Elevation: _____		
Date Started: 8/29/17		SIZE 4"	1 3/8"	_____	Station: _____		
Date Completed: 8/30/17		HAMMER 300#	140#	---	Groundwater level readings		
Driller: K.Eastwood		FALL 30"	30"	---	Date _____	Depth N	
Site Rep.: _____					Date _____	Depth _____	
Depth ft	Sample				Sample Description		
	No.	Depth ft	Pen. in	Rec. in			Blows/6"
	S-1	0.0-2.0	24	6	2-5-4-5	S-1 Moist stiff brown SILT and fine SAND, TOPSOIL and Roots	
	S-2	4.0-6.0	24	5	7-2-2-3	S-2 Moist loose dark brown fine to coarse SAND, some sandy Silt	
10	S-3	9.0-11.0	24	3	17-11-15-16	S-3 Moist medium dense gray fine to coarse GRAVEL, some silty Sand	
	S-4	14.0-16.0	24	5	8-9-6-13	S-4 Moist medium dense gray fine to coarse SAND and GRAVEL, trace gray Silt	
20	S-5	19.0-21.0	24	6	6-8-9-7	S-5 Moist medium dense gray fine to medium GRAVEL, little Sand	
	S-6	24.0-26.0	24	6	9-8-5-8	S-6 Moist medium dense gray fine to coarse GRAVEL, little gray Sand	
30	S-7	29.0-31.0	24	5	8-9-8-9	S-7 Similar to S-6	
	S-8	34.0-36.0	24	2	13-13-11-12	S-8 Similar to S-6	
40	S-9	39.0-41.0	24	5	14-16-13-15	S-9 Moist medium dense gray fine to coarse SAND and GRAVEL	
	S-10	44.0-46.0	24	8	11-12-11-14	S-10 Similar to S-9	
50	S-11	49.0-51.0	24	9	12-15-14-14	S-11 Moist medium dense brown SAND and GRAVEL, little Loam and fine Sand	
	S-12	54.0-56.0	24	10	21-23-22-17	S-12 Moist medium dense gray fine to coarse SAND and GRAVEL, trace gray Silt	
60	S-13	56.0-58.0	24	12	10-9-9-8	No sample was recovered with the 2" split spoon. 3" split spoon used instead. Rock was found at the end of the sample S-13 Moist medium dense gray fine to coarse silty SAND, trace gray Silt 2' Split spoon extension used w/o drilling Bottom of exploration at 58.0' AUTOMATIC HAMMER USED	
Ground Surface to _____ used then _____							
Proportions Used		Cohesive Consistency Blows/ft			Cohesionless Density Blows/ft		Sample Type
Trace	0 to 10%	0-2	Very Soft	9-15	Stiff	0-10	Loose
Little	10 to 20%	3-4	Soft	16-30	V-Stiff	10-30	M-Dense
Some	20 to 35%	5-8	M-Stiff	31+	Hard	30-50	Dense
And	35 to 50%					50+	V-Dense
Notes:	1. The stratification lines represent the approximate boundary between soil types. The transition may be gradual. 2. Water level readings were made in the drill hole during or at the completion of drilling. The water level may fluctuate over time.						
Remarks:	NOTE: All soil descriptions are made in the field by the Drilling Foreman. No laboratory analyses were performed for this purpose.						

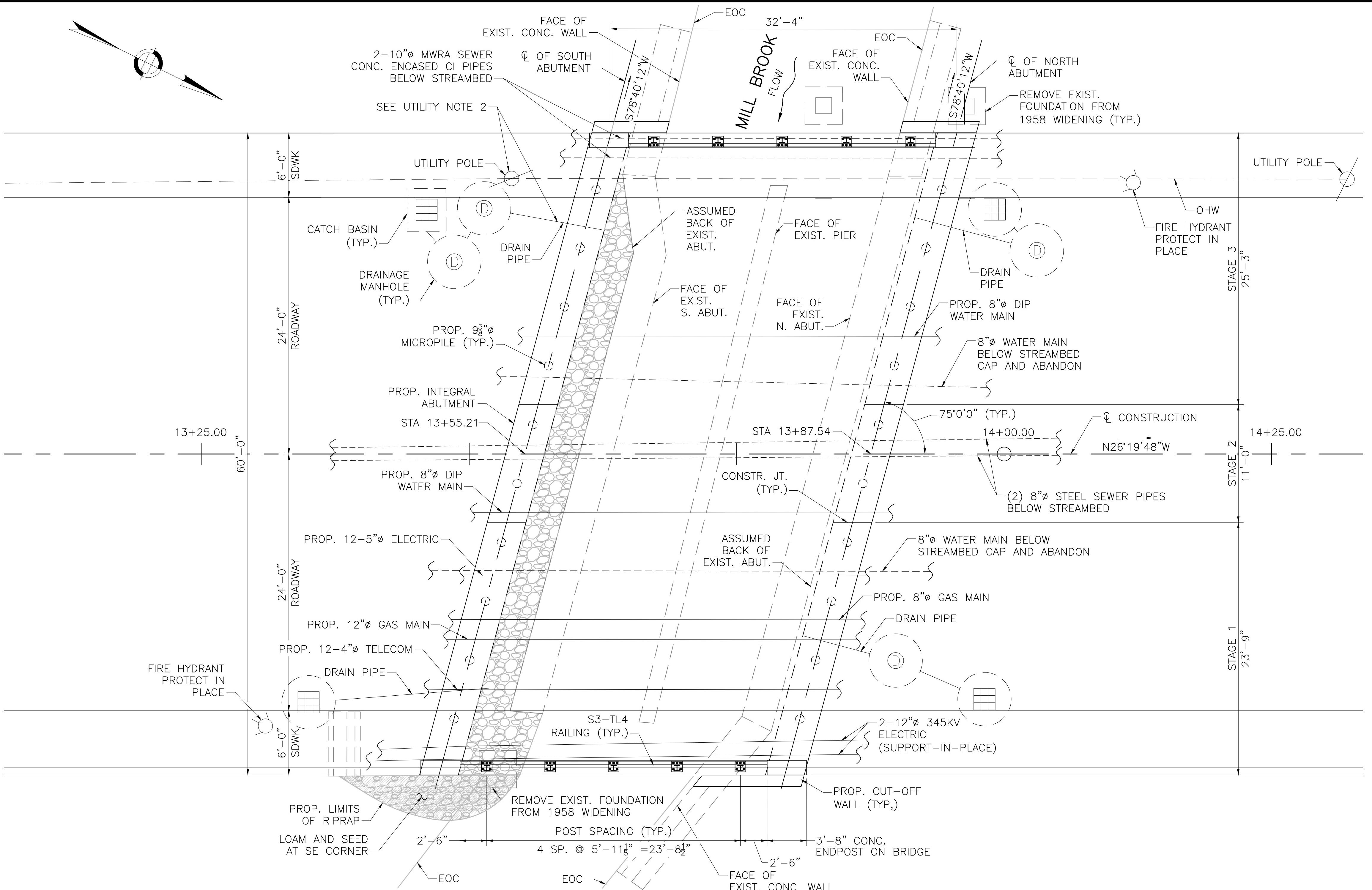
NOTE:
APPROXIMATE LOCATION OF BB-2
GROUND SURFACE EL. 16.0
STA 14+10.3, OFFSET 56.5' LT

BORING NOTES:

1. LOCATION OF BORINGS SHOWN ON THE KEY PLAN THUS: 
 2. BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORINGS POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
 3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
 4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A $1\frac{3}{8}$ " I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
 5. ALL BORINGS WERE MADE IN AUGUST 2017.
 6. BORINGS WERE MADE BY: GEOLOGIC – EARTH EXPLORATION, INC., 7 SHERWOOD DRIVE, NORFOLK, MA 02056
 7. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.
 8. BORING SAMPLES ARE STORED IN THE ARLINGTON DEPARTMENT OF PUBLIC WORKS BUILDING AT 51 GROVE STREET, ARLINGTON, MA. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE ENGINEERING DIVISION AT 781-316-3320.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
APPROVED UNDER PROVISIONS OF
MASS. GEN. LAWS CH 85 S 35

BORINGS



UTILITY NOTES:

- EXISTING UTILITIES TO BE RELOCATED ARE OMITTED FOR CLARITY.
- ONLY UTILITIES AND UTILITY STRUCTURES WITHIN THE BRIDGE ARE SHOWN FOR CLARITY. SEE SHEET 21 FOR INFORMATION NOT SHOWN.
- CONTRACTOR TO COORDINATE WITH UTILITY COMPANY TO PROVIDE ADEQUATE SUPPORT TO UTILITY POLE DURING THIS PHASE OF CONSTRUCTION.

BRIDGE REPLACEMENT TOWN OF ARLINGTON

PROPOSED BRIDGE REPLACEMENT
A-10-015 (C10)
US3 (MYSTIC STREET) OVER MILL BROOK

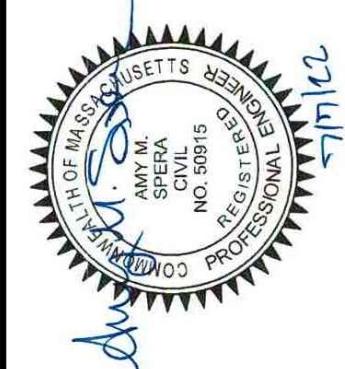
GENERAL
PLAN &
LONGITUDINAL
SECTION
SHEET 4 OF
25

63 KENDRICK STREET
NEEDHAM, MA 02494
781-355-7100
781-355-7101 (FAX)

GILL
ENGINEERING

DATE

REGISTERED PROFESSIONAL ENGINEER



COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
APPROVED UNDER PROVISIONS OF
MASS. GEN. LAWS CH 85 S 35
8/1/2022
BRIDGE ENGINEER
DATE



BRIDGE REPLACEMENT

TOWN OF ARLINGTON

PROPOSED BRIDGE REPLACEMENT

A-10-015 (C10) OVER MILL BROOK

US3 (MYSTIC STREET) OVER MILL BROOK

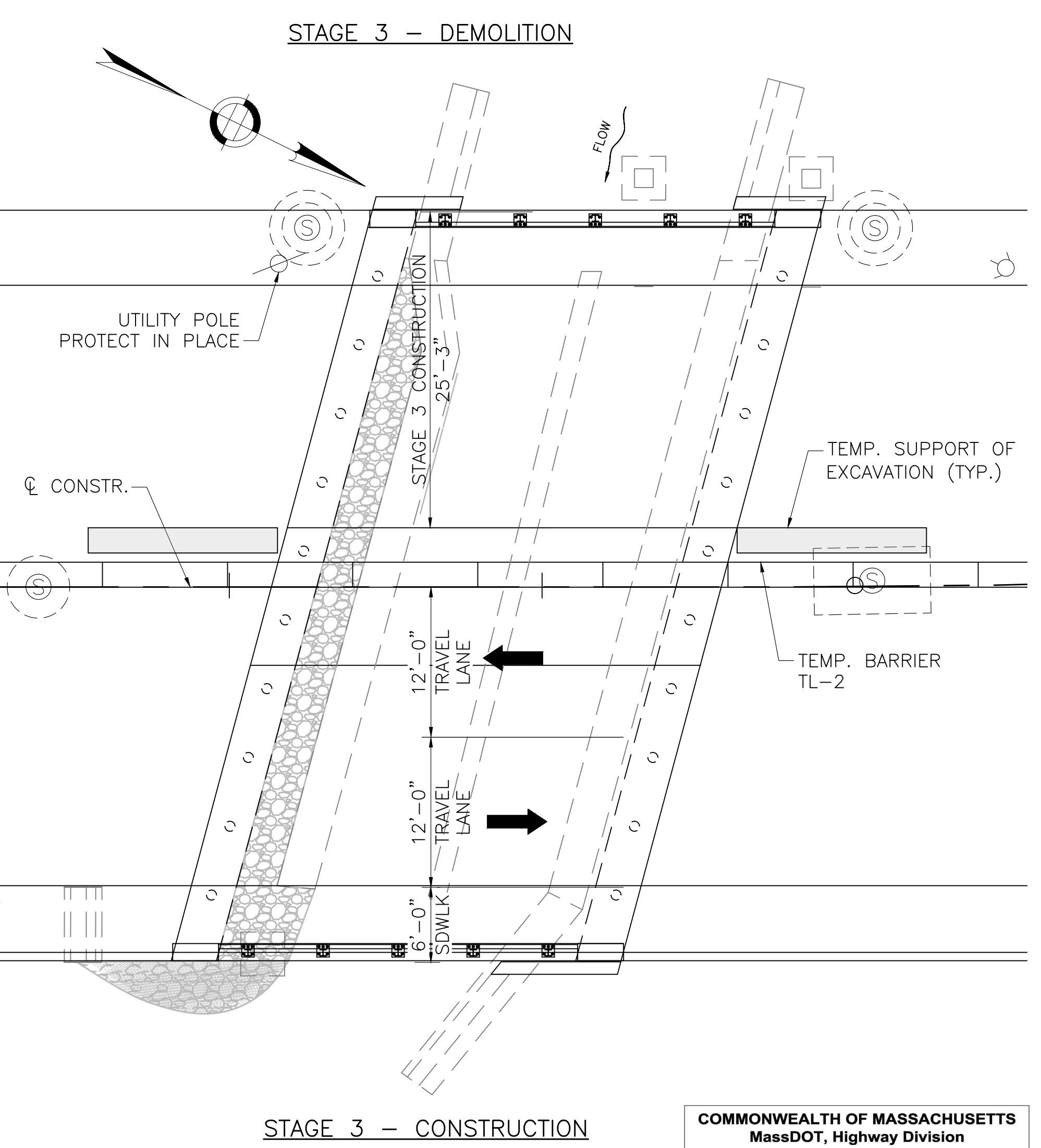
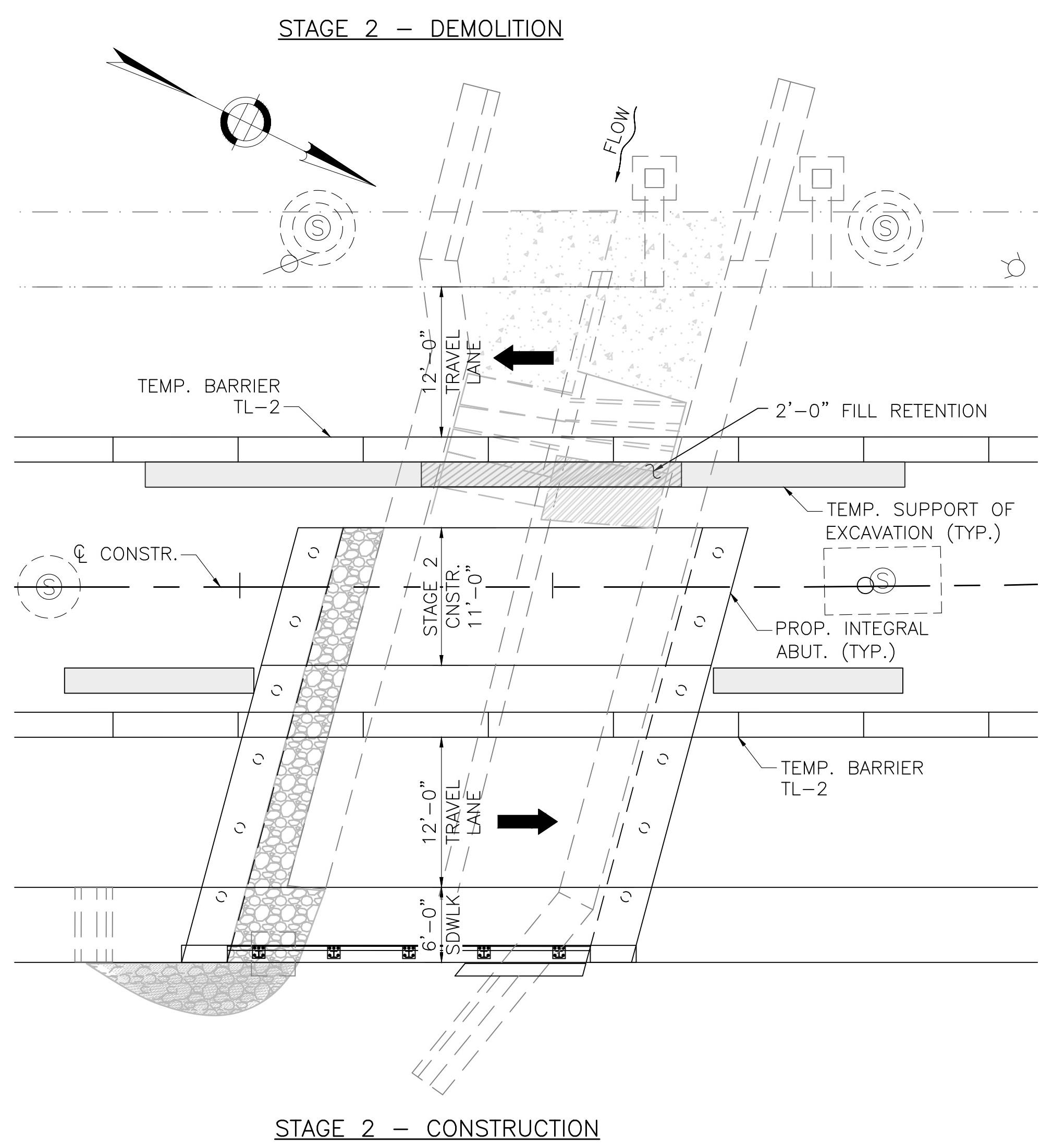
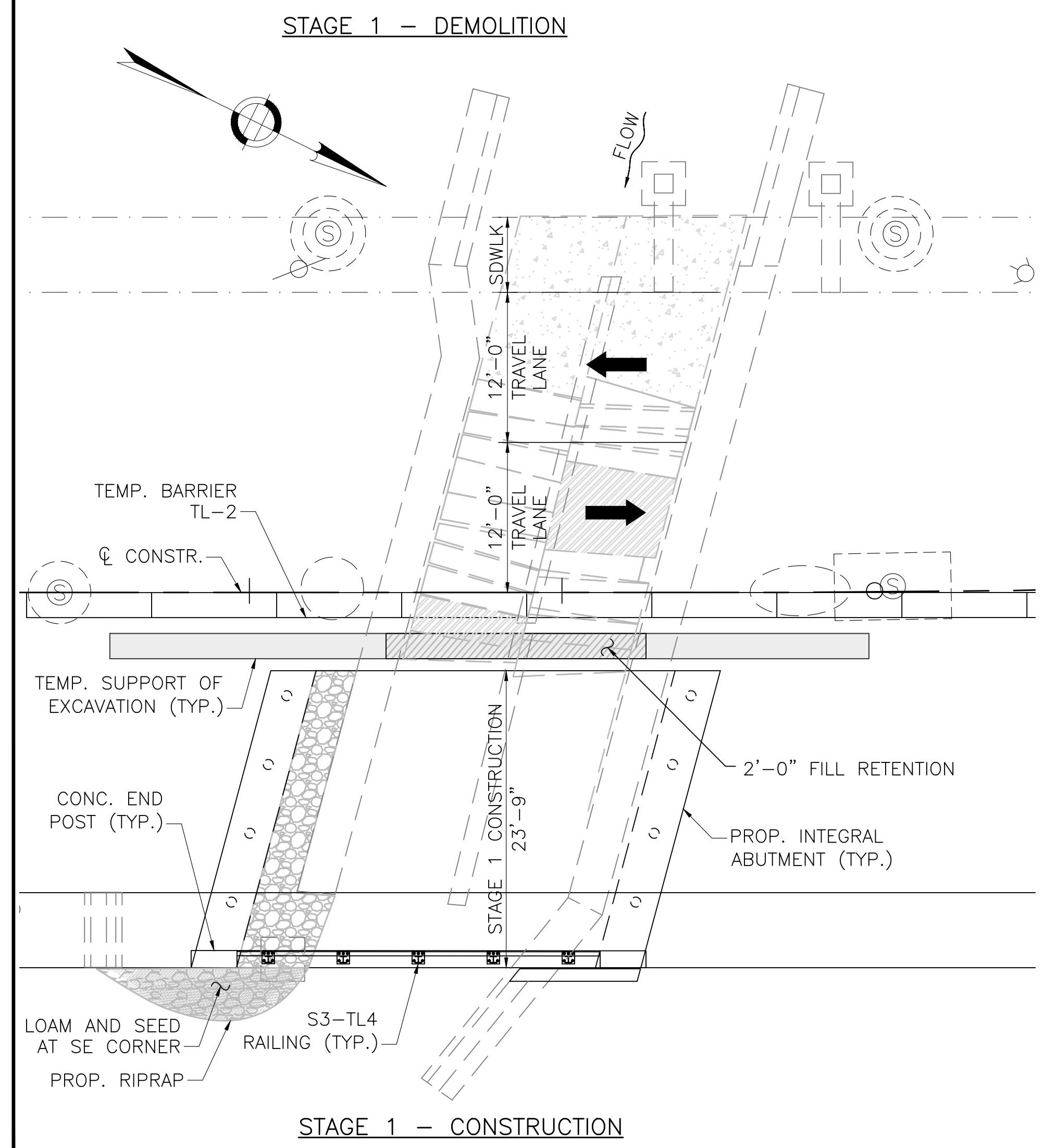
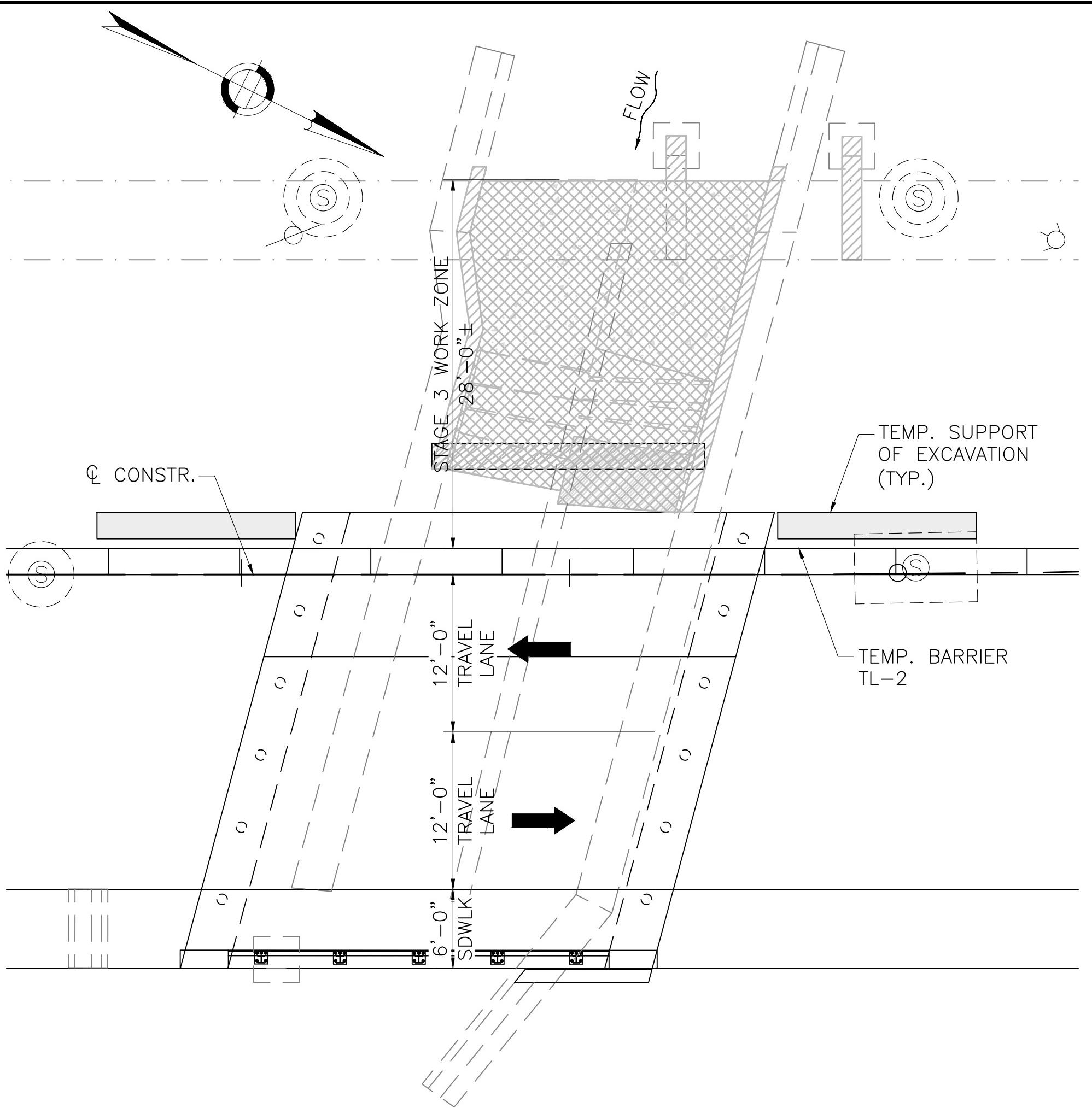
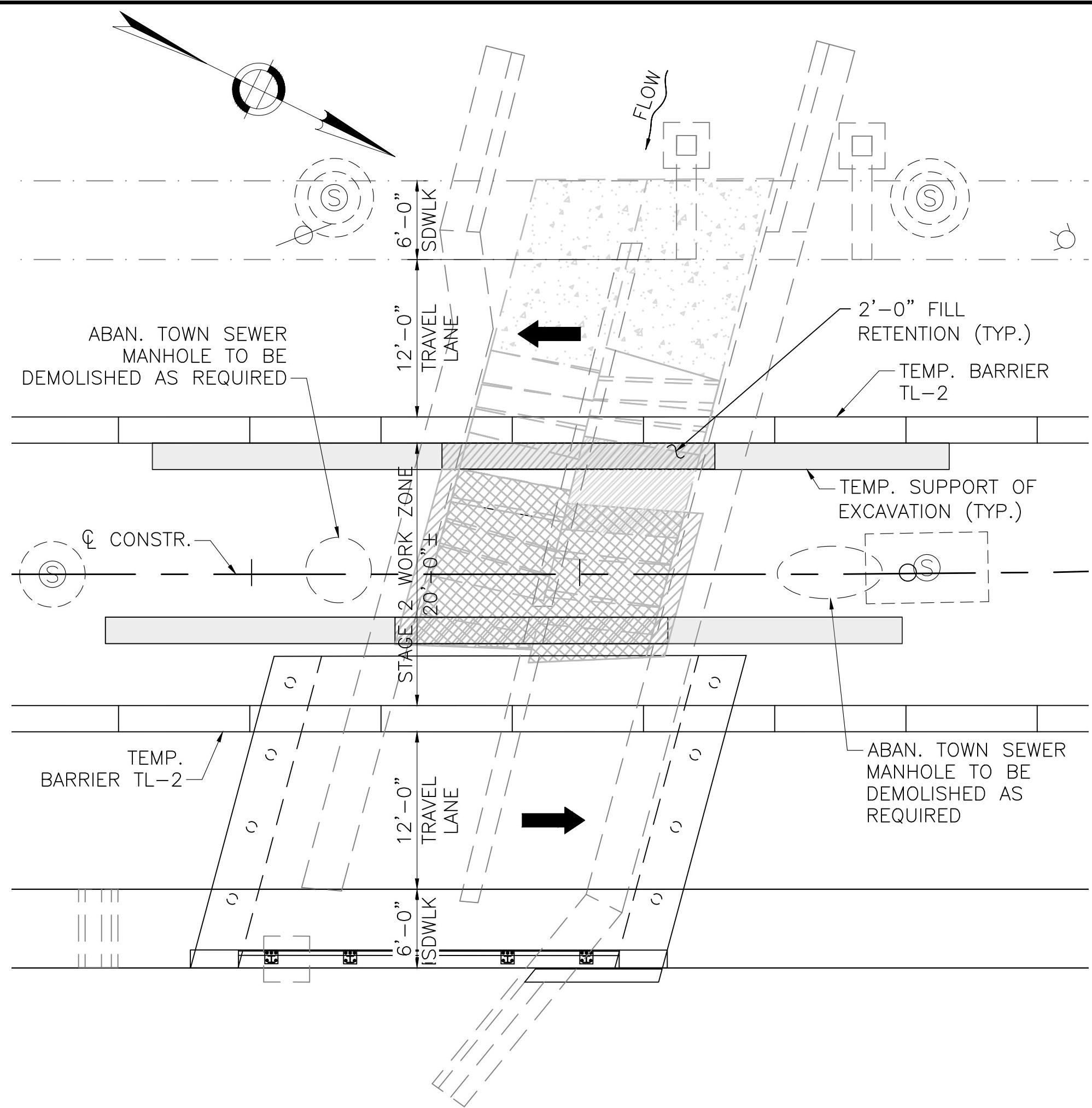
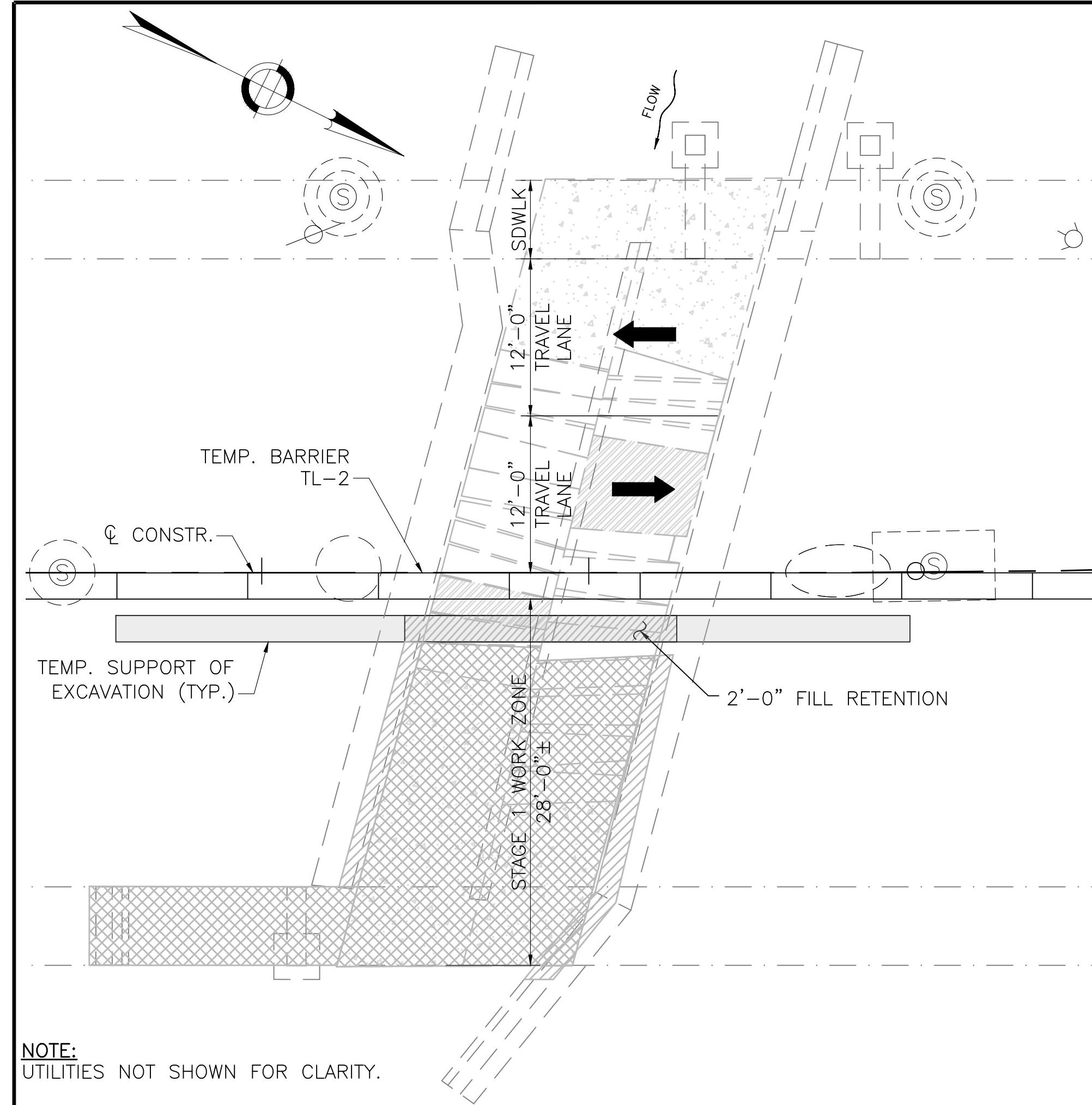
CONSTRUCTION
STAGING PLAN

SHEET 5 OF
25

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
APPROVED UNDER PROVISIONS OF
MASS. GEN. LAWS CH 85 § 35
8/1/2022
BRIDGE ENGINEER
DATE

SCALE: $\frac{1}{8}$ " = 1'-0"

CONSTRUCTION STAGING PLAN



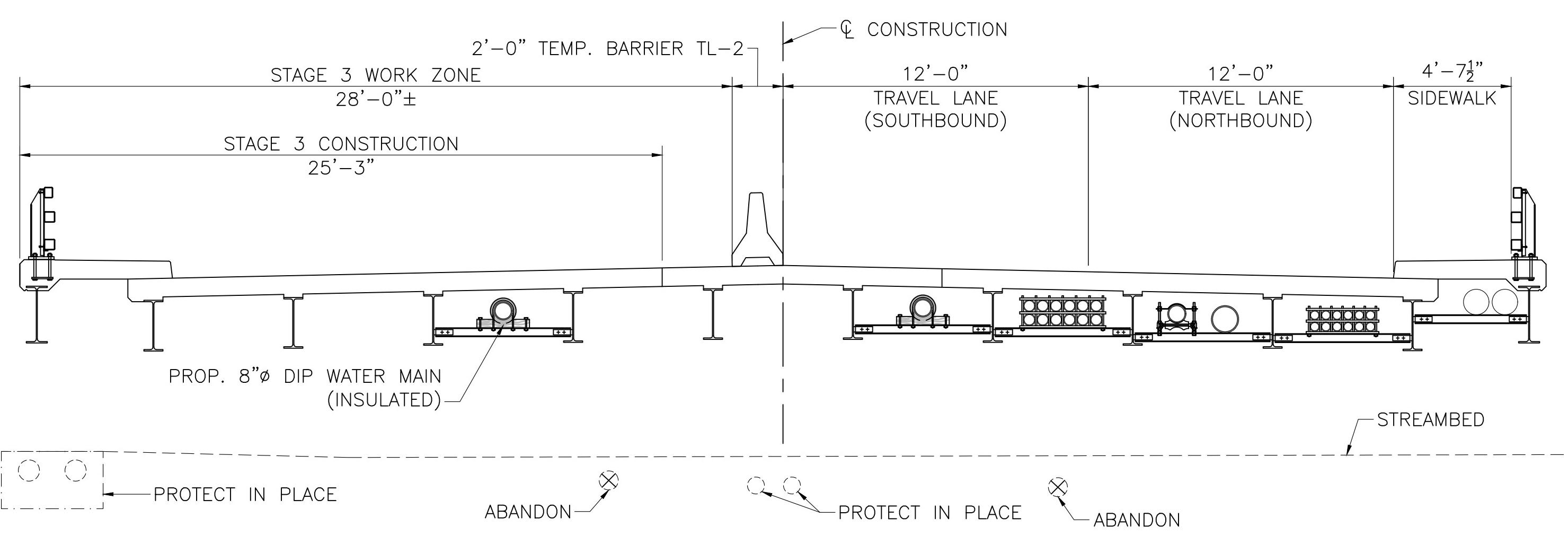
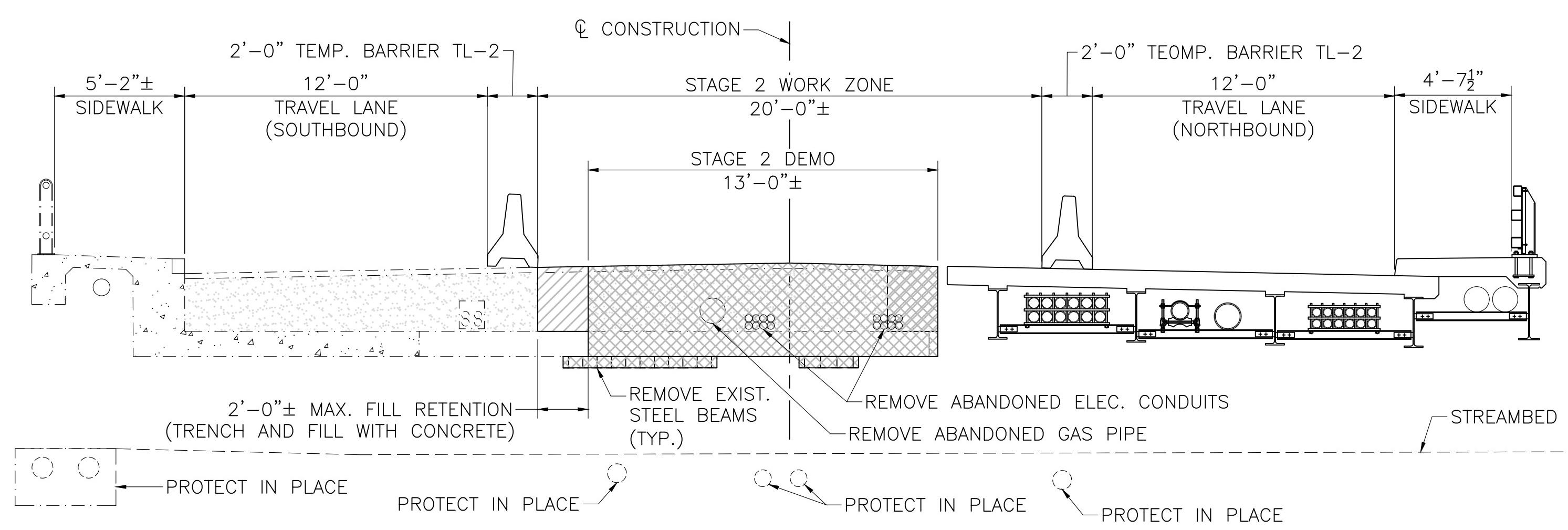
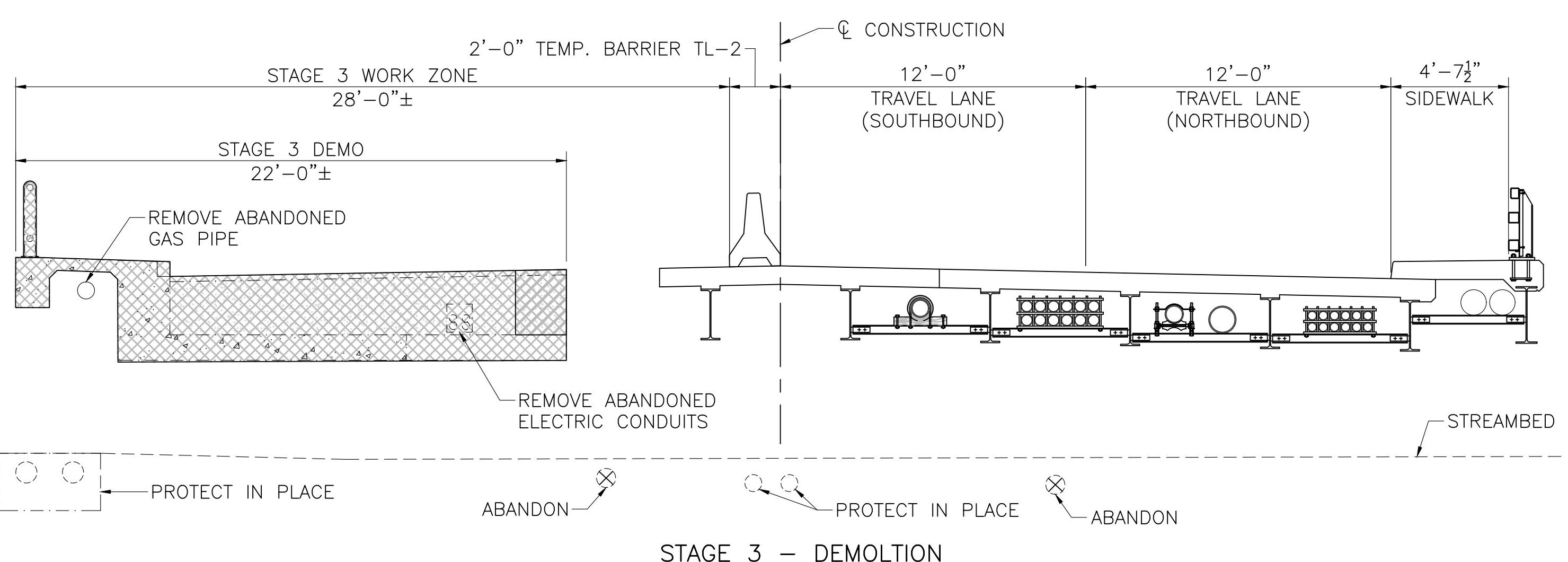
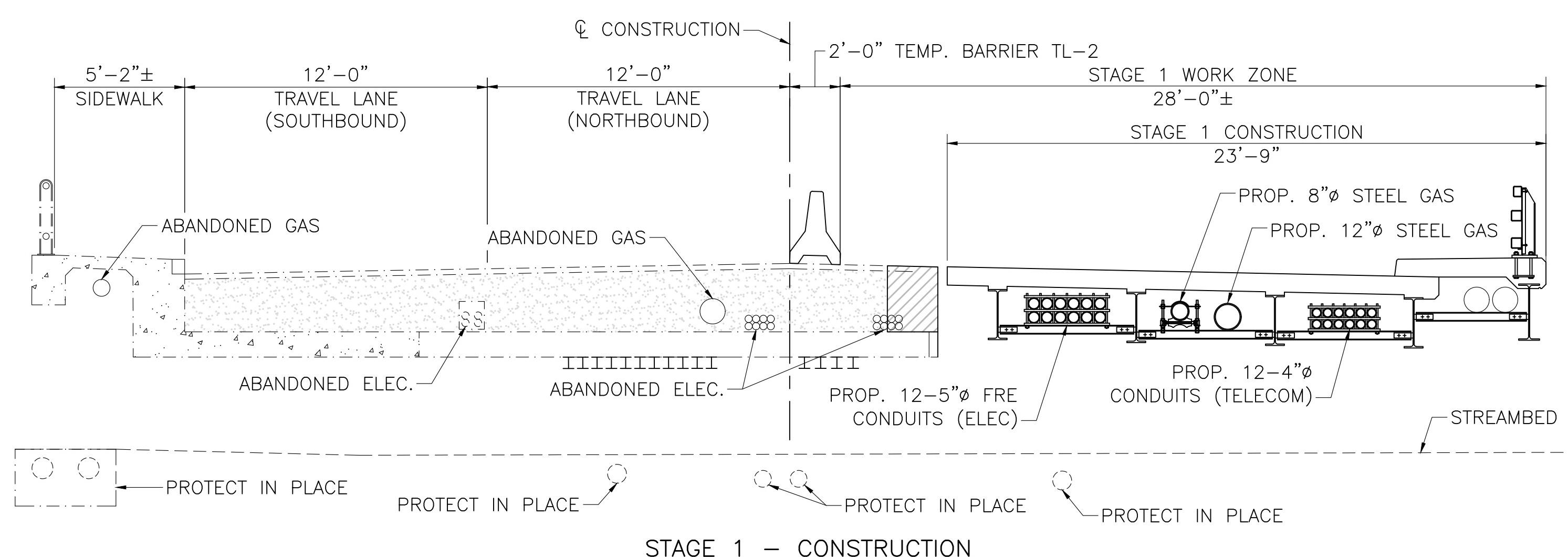
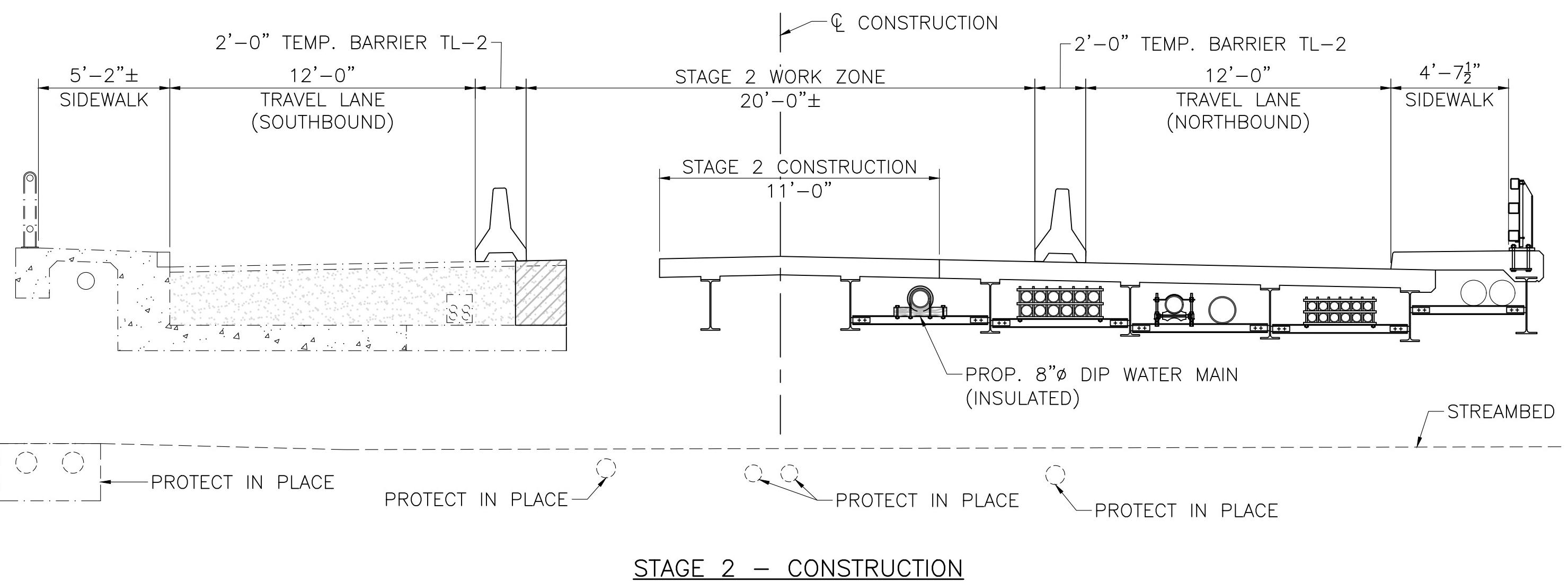
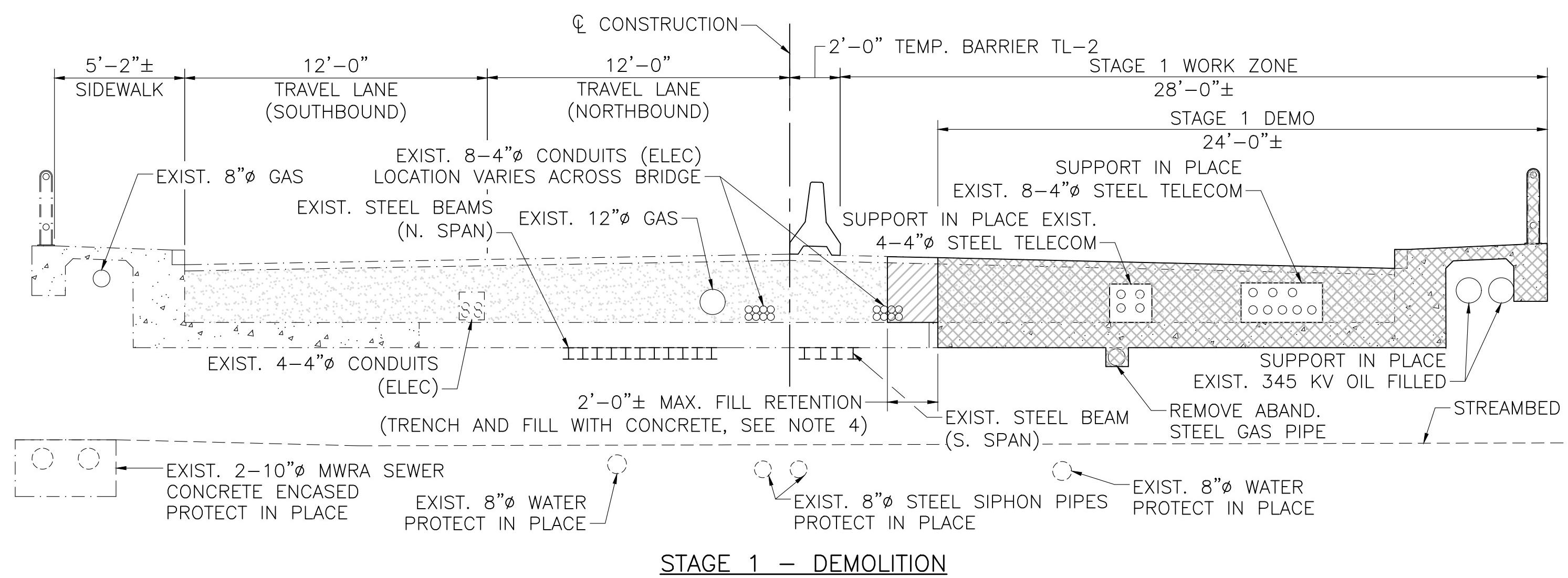


BRIDGE REPLACEMENT
TOWN OF ARLINGTON

PROPOSED BRIDGE REPLACEMENT
A-10-015 (C10)
US3 (MYSTIC STREET) OVER MILL BROOK

CONSTRUCTION
STAGING

SHEET 6 OF
25



NOTES:

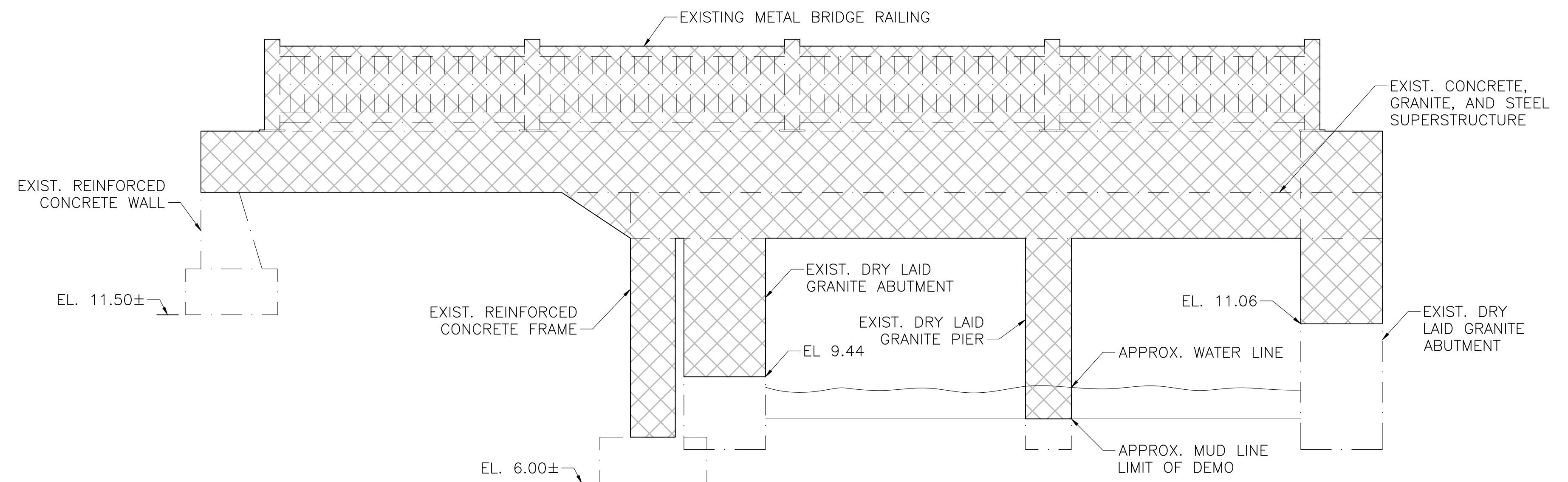
1. WATER UTILITY RELOCATIONS BY TOWN OF ARLINGTON.
2. TEMPORARY UTILITY SUPPORTS BY OTHERS.
3. ALL OTHER UTILITY RELOCATIONS BY OTHERS.
4. CONCRETE FILL RETENTION SHOWN IS CONCEPTUAL. CONTRACTOR TO DESIGN.

CONSTRUCTION STAGING

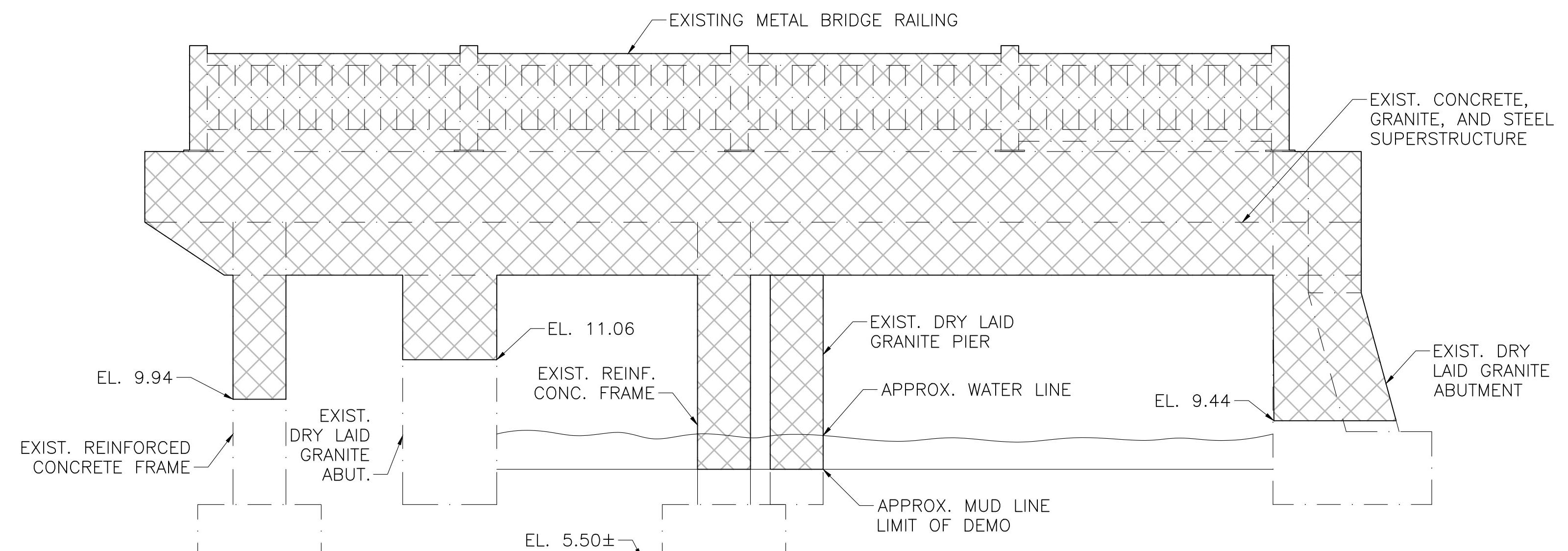
SCALE: 4" = 1'-0"

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
APPROVED UNDER PROVISIONS OF
MASS. GEN. LAWS CH 85 § 35
Christopher J. Baker
BRIDGE ENGINEER
DATE

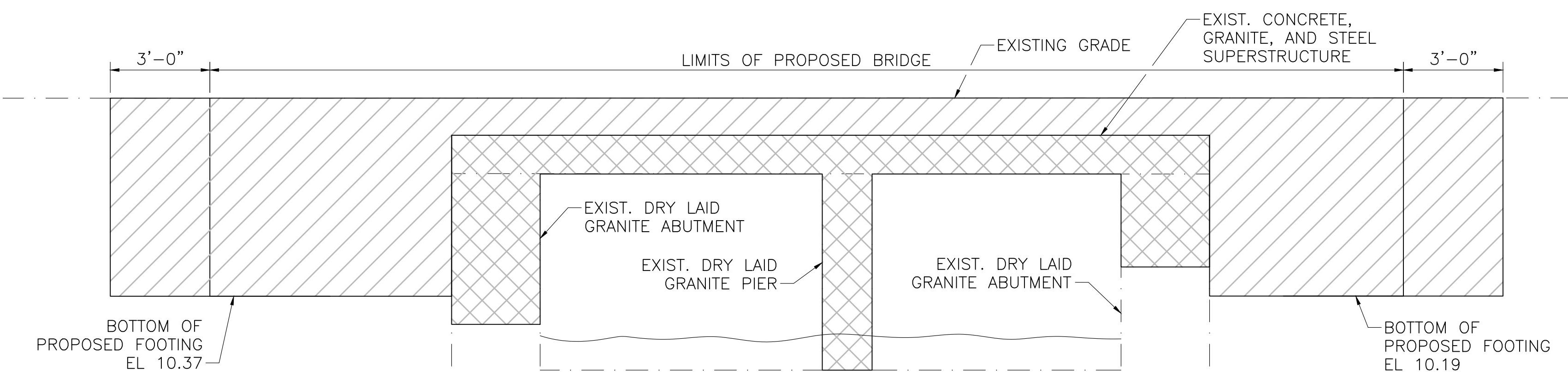
63 KENDRICK STREET
NEEDHAM, MA 02494
781-355-7100
781-355-7101 (FAX)



EAST ELEVATION



WEST ELEVATION



LONGITUDINAL SECTION

LIMITS OF DEMOLITION

SCALE: $\frac{3}{8}$ " = 1'-0"

- APPROXIMATE LIMITS OF DEMOLITION
- APPROXIMATE LIMITS OF BRIDGE EXCAVATION

NOTE:
UTILITIES NOT SHOWN. SEE CONSTRUCTION STAGING SECTIONS AND UTILITY PLAN.

DATE	DRAWN BY	CALC. BY	APPRV. BY	DESCRIPTION
07/07/2022	FB		AMS	ISSUED FOR CONSTRUCTION
REGISTERED PROFESSIONAL ENGINEER _____ DATE _____				



BRIDGE REPLACEMENT TOWN OF ARLINGTON	PROPOSED BRIDGE REPLACEMENT A-10-015 (C10) US3 (MYSTIC STREET) OVER MILL BROOK
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DEMOLITION DETAILS
SHEET 7 OF 25

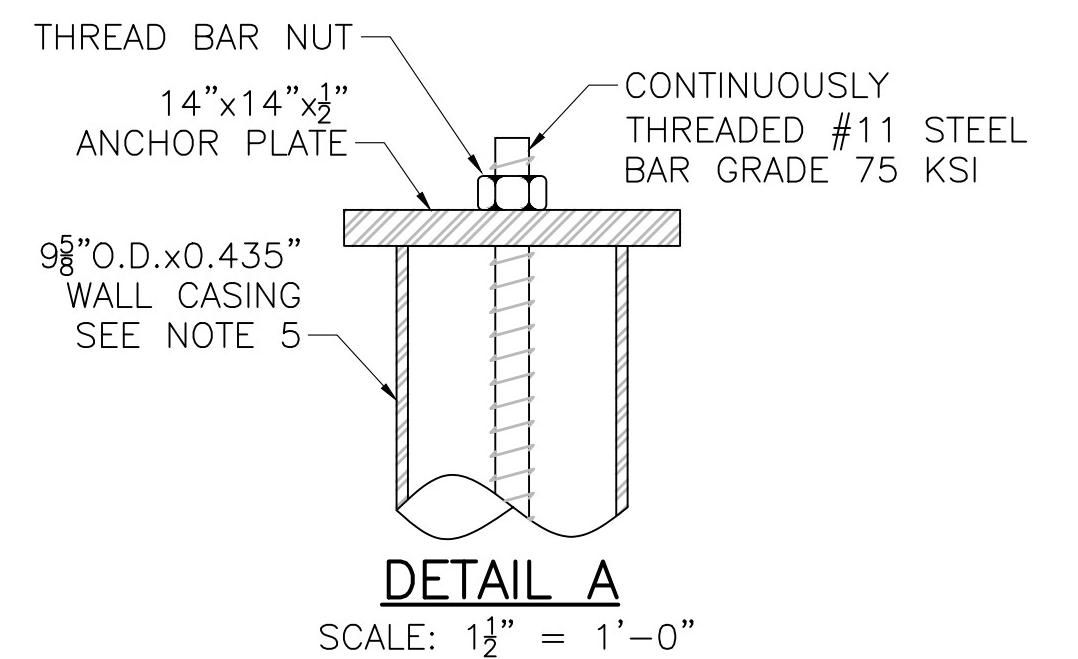
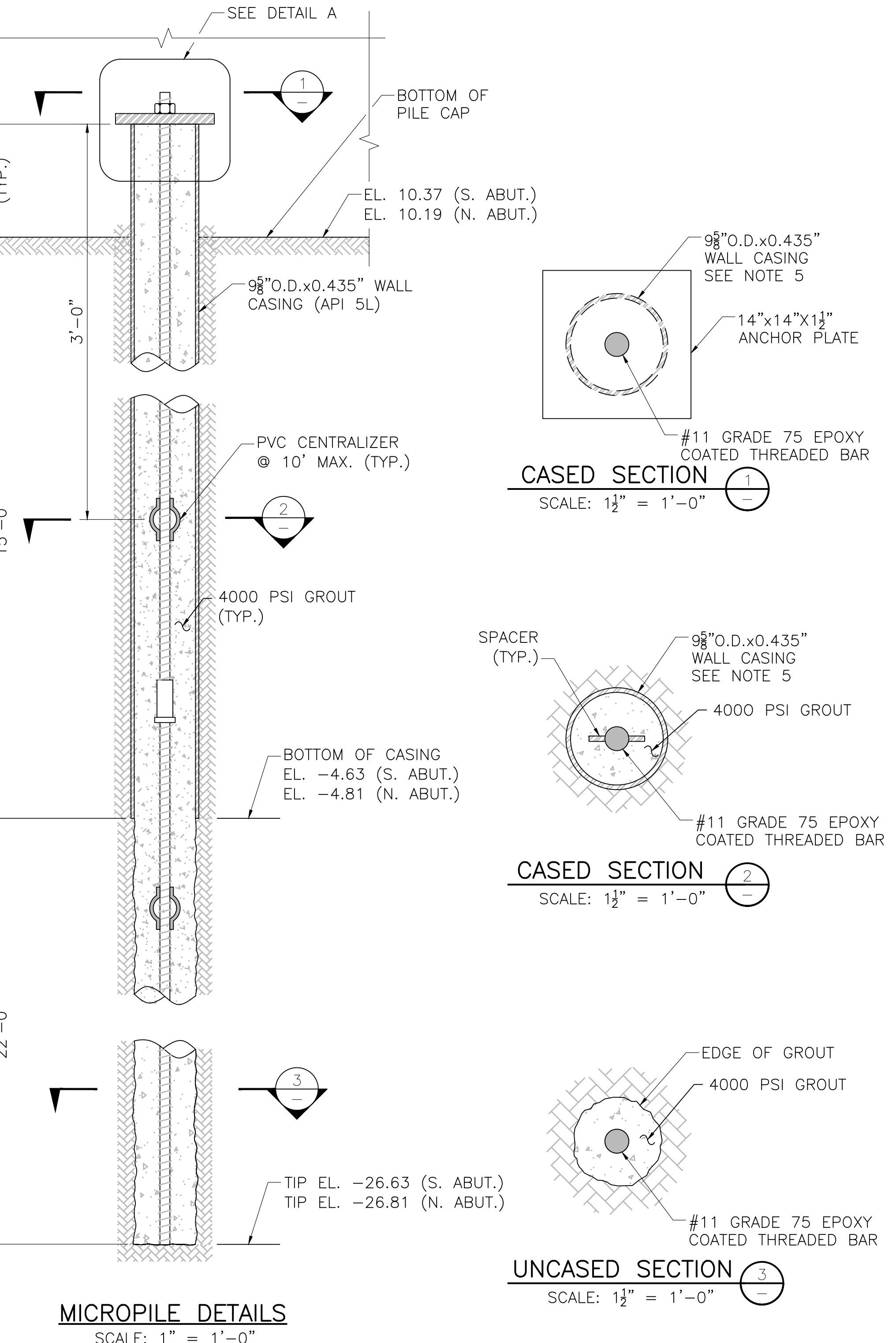
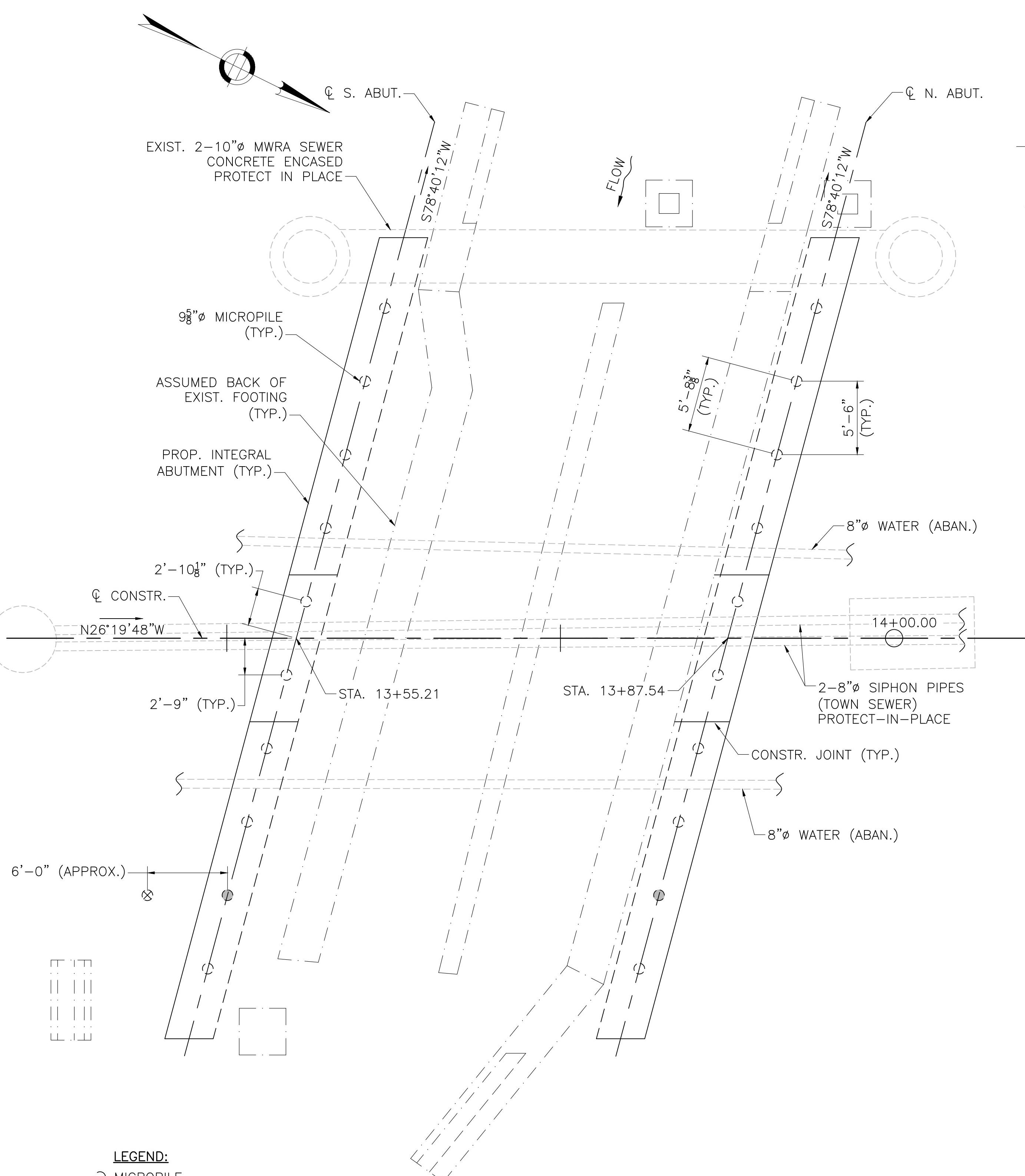
DATE	DRW BY	CALC BY	APPRV BY	DESCRIPTION
07/07/2022	FB	AMS		ISSUED FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER _____ DATE _____



BRIDGE REPLACEMENT
TOWN OF ARLINGTON
PROPOSED BRIDGE REPLACEMENT
A-10-015 (C10)
US3 (MYSTIC STREET) OVER MILL BROOK

FOUNDATION
PLAN &
MICROPILE
DETAILS
SHEET 8 OF
25



MICROPILE NOTES:

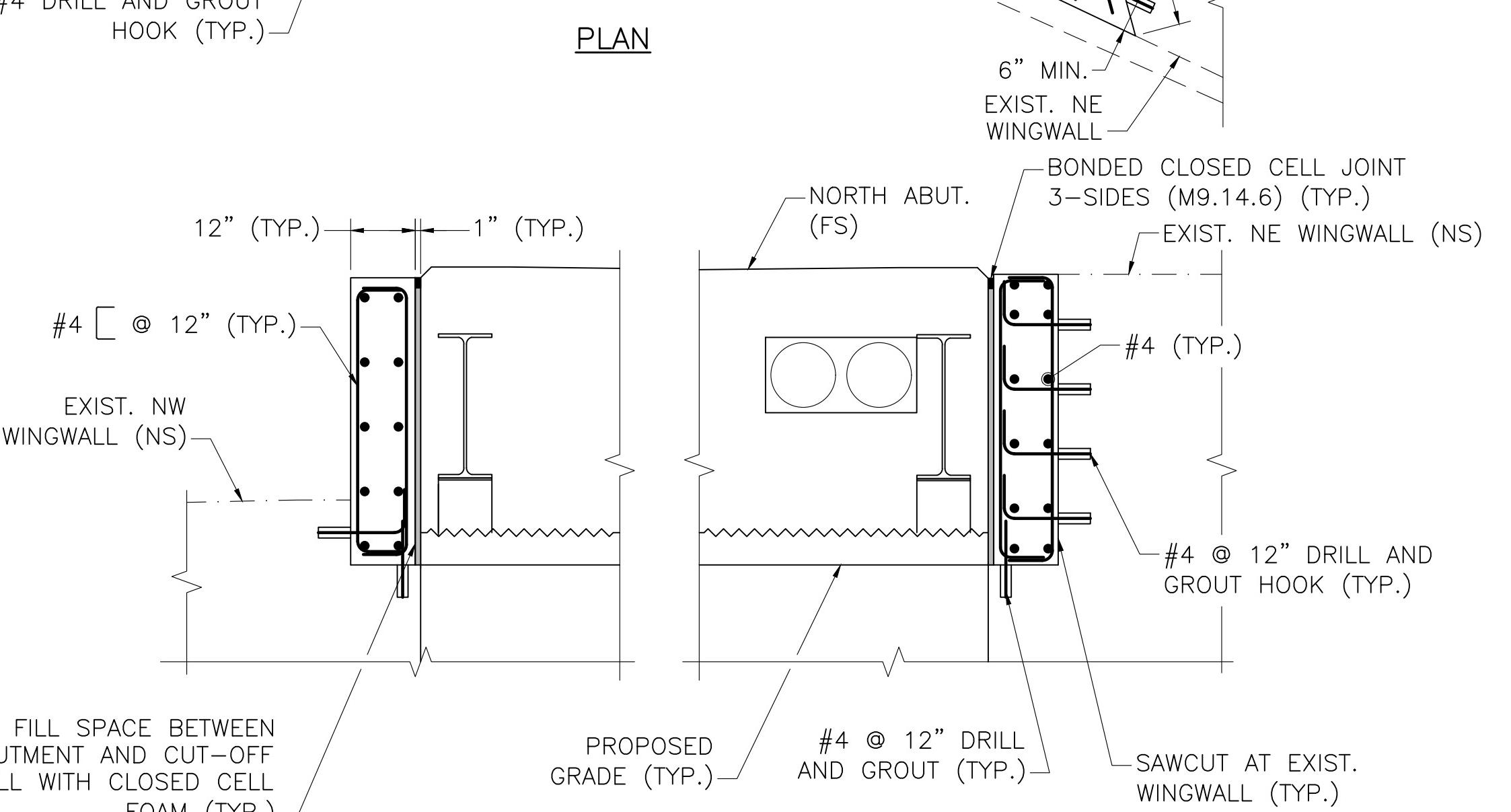
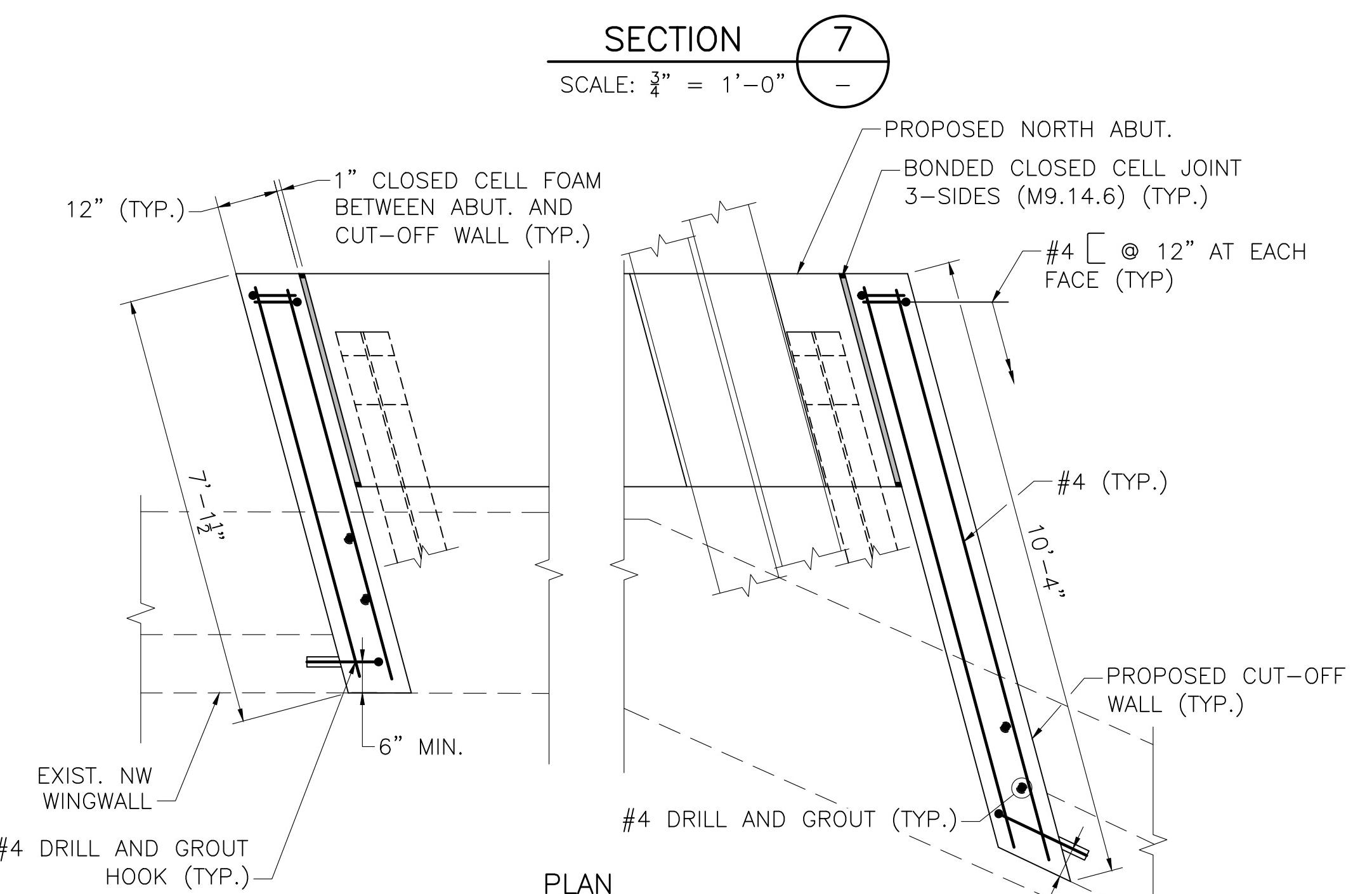
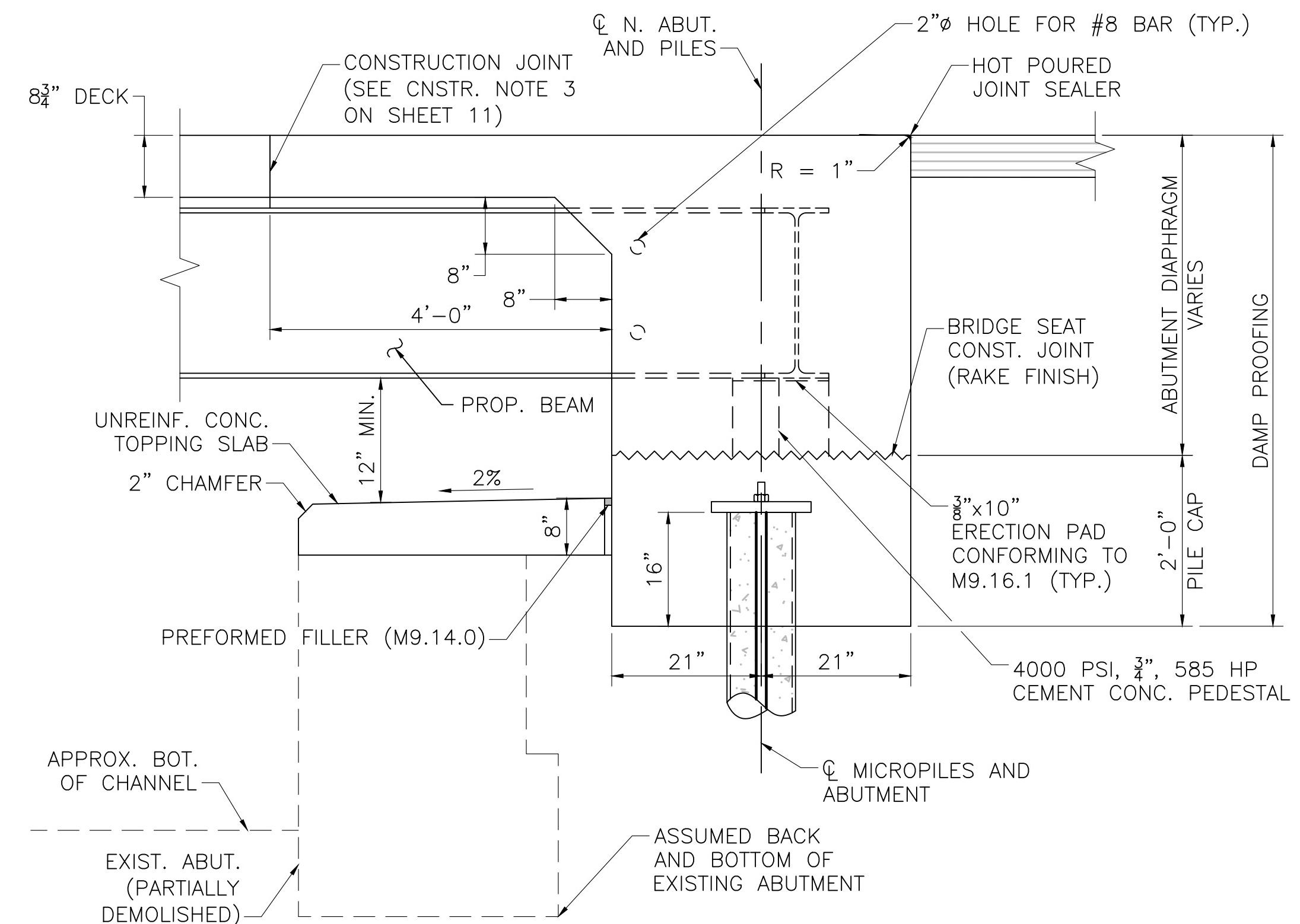
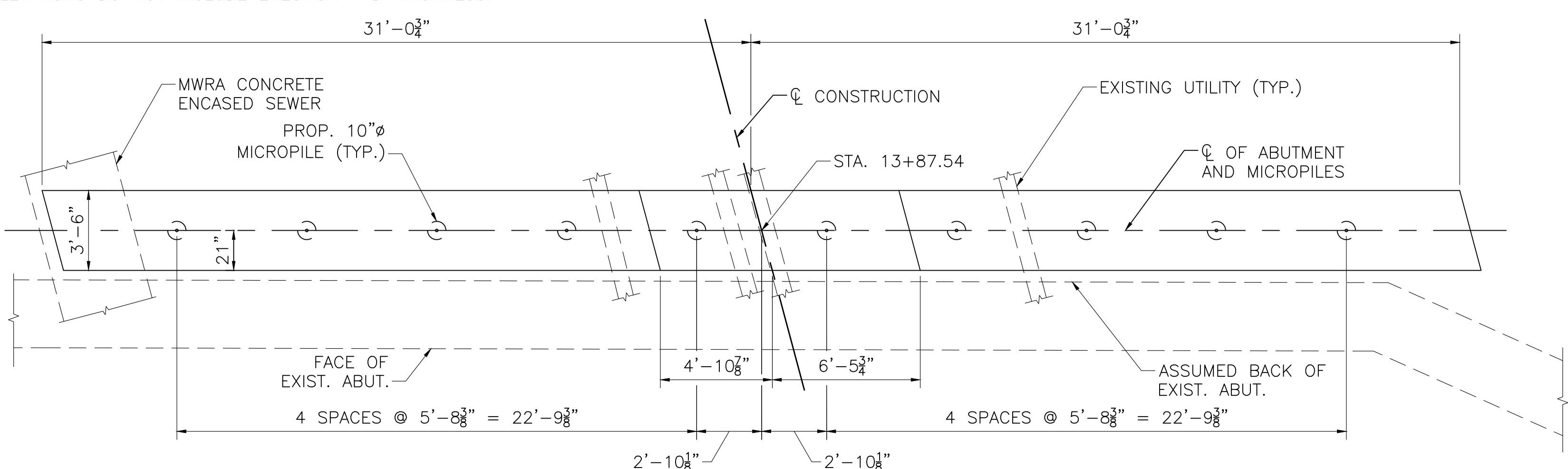
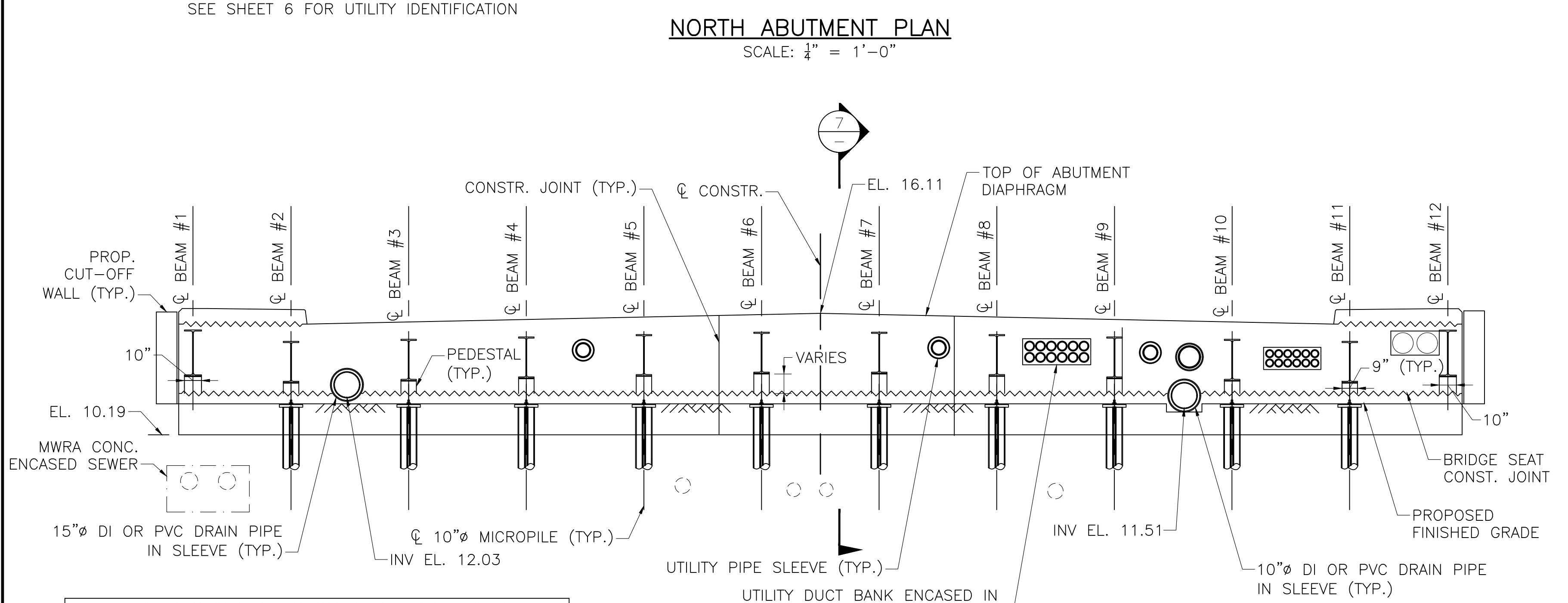
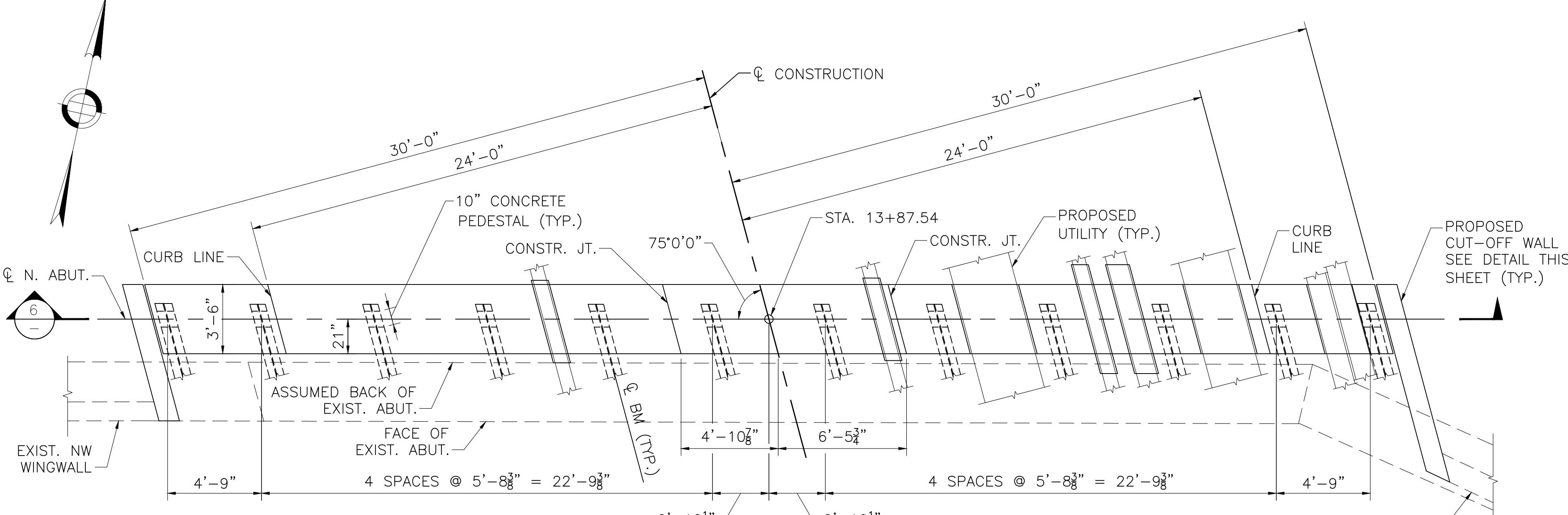
- THE FACTORED AXIAL DESIGN LOAD PER MICROPILE IS 80.4 KIPS AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.
- THE FACTORED STRUCTURAL RESISTANCE PER MICROPILE IS 134.0 KIPS AND IS THE PRODUCT OF THE NOMINAL STRUCTURAL RESISTANCE OF 178.7 KIPS AND A RESISTANCE FACTOR OF 0.75.
- THE FACTORED GEOTECHNICAL PILE RESISTANCE IS 90.1 KIPS AND IS THE PRODUCT OF THE NOMINAL GEOTECHNICAL RESISTANCE OF 163.9 KIPS AND A RESISTANCE OF 0.55.
- THE ESTIMATED TIP ELEVATION IS -26.63 FEET AT SOUTH ABUTMENT AND -26.81 FEET AT NORTH ABUTMENT.
- STEEL CASING SHALL BE PRIME STEEL AND MEET THE REQUIREMENTS OF API 5L PSL1 GRADE 52 KSI WITH SR 15 SUPPLEMENTAL REQUIREMENTS.
- REINFORCEMENT BAR SHALL BE CONTINUOUSLY THREADED FOR THE ENTIRE BAR LENGTH CONFORMING TO ASTM A615, HAVING MINIMUM YIELD STRENGTH OF 75 KSI.
- THREAD BAR NUT AND COUPLING FROM THE SAME MANUFACTURER AS THE THREAD BAR SHALL CONFORM TO THREAD BAR MANUFACTURER REQUIREMENTS.
- BAR COUPLING SHALL BE FULL ENGAGEMENT BAR COUPLER. BAR COUPLING SHALL NOT BE LOCATED WITHIN THE TOP THIRD OF THE PILE LENGTH.
- ANCHOR PLATE SHALL MEET REQUIREMENTS OF ASTM M270 GRADE 50.
- GROUT SHALL HAVE A MINIMUM OF 28-DAY COMPRESSIVE STRENGTH OF 4,000 PSI AND BE IN ACCORDANCE WITH ASTM C109.
- GROUT SHALL BE PLACED USING TREMIE METHODS.
- THE CONTRACTOR SHALL SUBMIT A MICROPILE SCHEDULE, MICROPILE INSTALLATION, AND MICROPILE TESTING PLAN FOR REVIEW AND APPROVAL OF THE ENGINEER.
- SEE SPECIAL PROVISION ITEM 945.10 DRILLED MICROPILES, ITEM 948.60 MICROPILE VERIFICATION LOAD TEST, AND ITEM 948.61 MICROPILE PROOF LOAD TEST FOR ADDITIONAL MICROPILE SPECIFICATIONS.



BRIDGE REPLACEMENT
TOWN OF ARLINGTON
PROPOSED BRIDGE REPLACEMENT
A-10-015 (C10) OVER MILL BROOK
US3 (MYSTIC STREET) OVER MILL BROOK

NORTH
ABUTMENT

SHEET 10 OF
25



ELEVATION
NORTH ABUTMENT - CUT-OFF WALL DETAILS
SCALE: $\frac{1}{2}$ " = 1'-0"

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
APPROVED UNDER PROVISIONS OF
MASS. GEN. LAWS CH 85 S 35
8/1/2022
BRIDGE ENGINEER
DATE

DATE _____
DRAWN BY _____
FB _____
CALC. BY _____
APPRV. BY _____
AMS _____
ISSUED FOR CONSTRUCTION _____

REGISTERED PROFESSIONAL ENGINEER _____

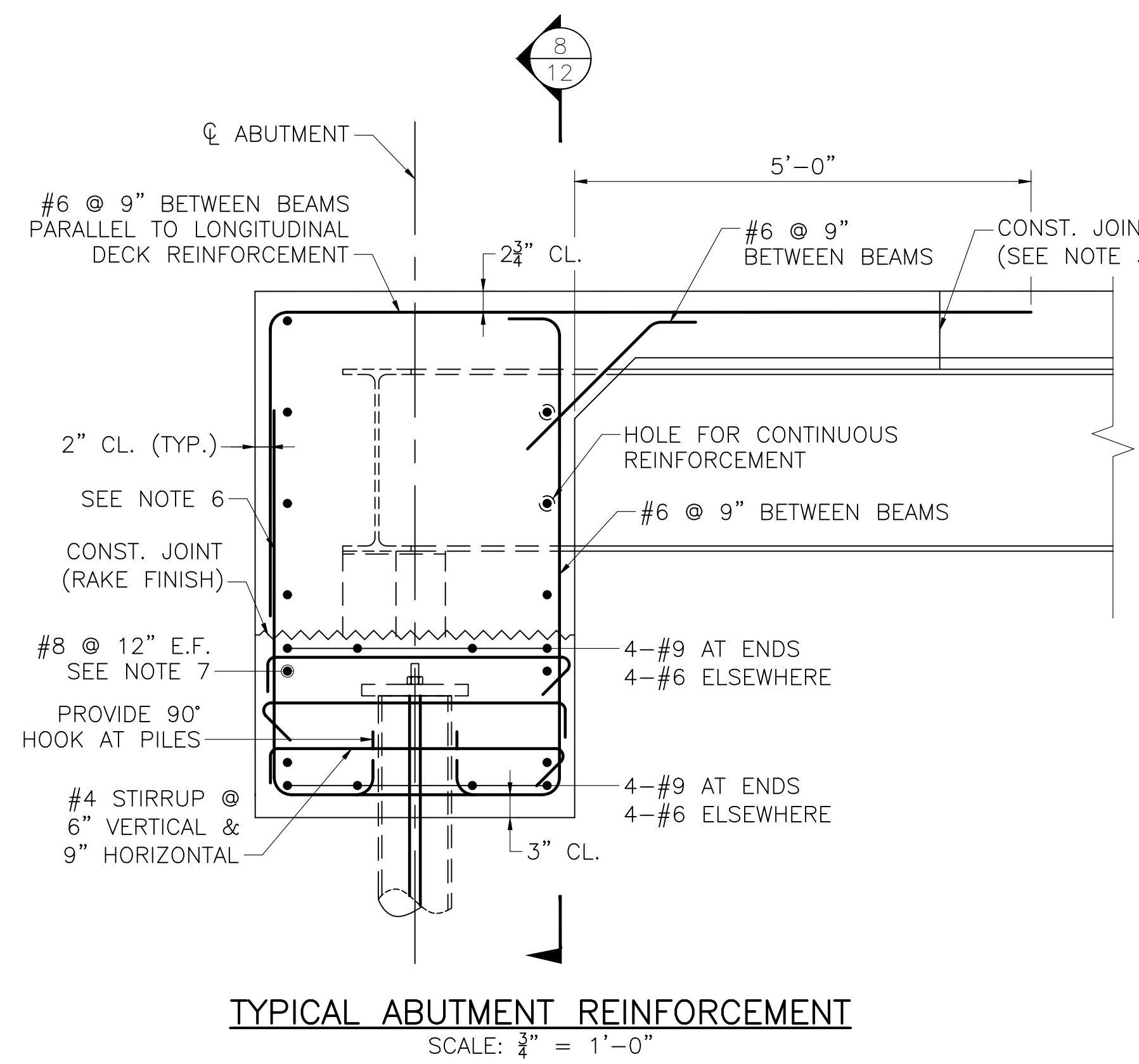


BRIDGE REPLACEMENT
TOWN OF ARLINGTON

PROPOSED BRIDGE REPLACEMENT
A-10-015 (C10)
US3 (MYSTIC STREET) OVER MILL BROOK

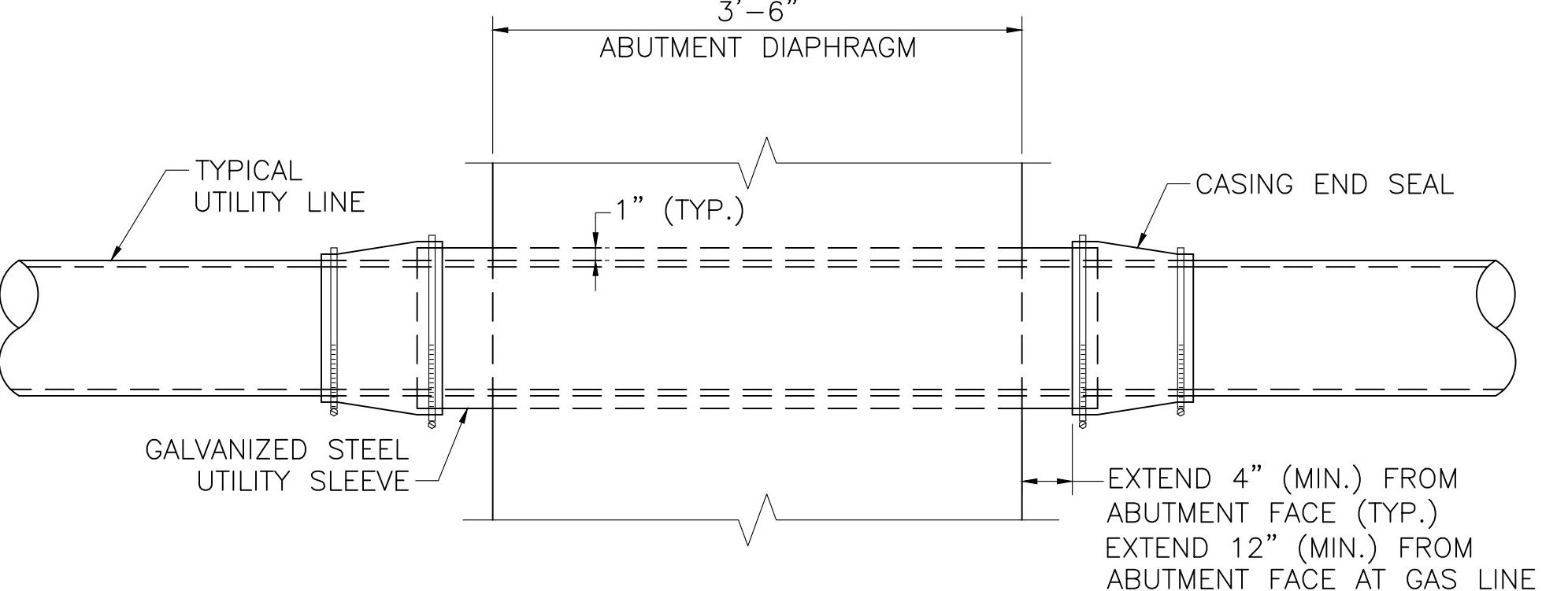
ABUTMENT
DETAILS (1
OF 2)

SHEET 11 OF
25



TYPICAL ABUTMENT REINFORCEMENT

SCALE: $\frac{1}{4}$ " = 1'-0"

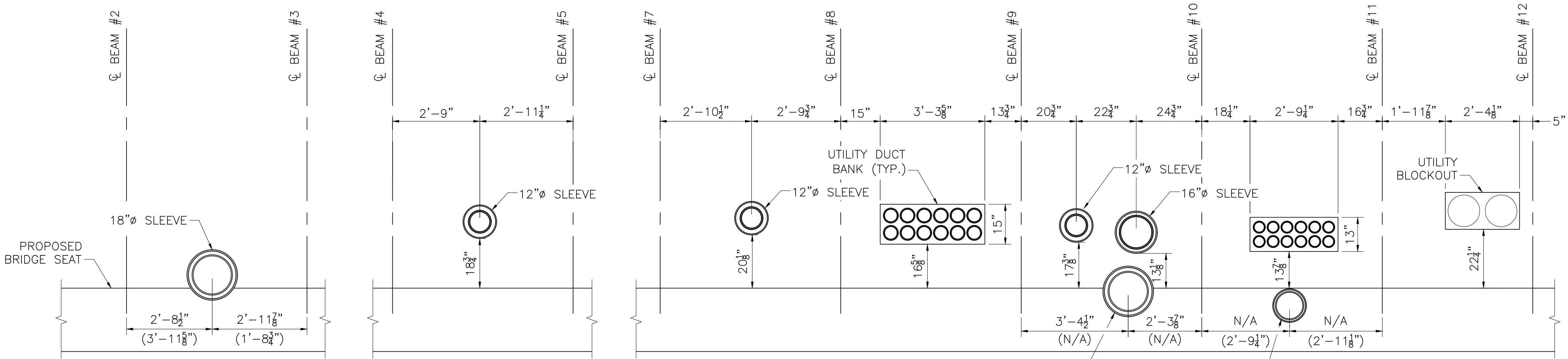


UTILITY SLEEVE DETAILS

SCALE: 1" = 1'-0"

CONSTRUCTION NOTES:

- ALL REINFORCEMENT SHALL BE COATED.
- DECK SLAB REINFORCEMENT NOT SHOWN FOR CLARITY. CONTINUE DECK SLAB REINFORCEMENT TO BACK OF ABUTMENT.
- THE CONTRACTOR SHALL FOLLOW THE DECK PLACEMENT SEQUENCE AS SHOWN ON THESE CONSTRUCTION DRAWINGS.
- ALL CONCRETE SHALL CONTAIN SUPERPLASTICIZER TO ENSURE ADEQUATE CONSOLIDATION.
- BOTH ABUTMENTS SHALL BE BACKFILLED SIMULTANEOUSLY. NO MORE THAN TWO (2) FEET OF DIFFERENTIAL BACKFILL HEIGHT SHALL BE PERMITTED. BACKFILLING SHALL NOT BEGIN UNTIL THE ABUTMENT AND DECK CONSTRUCTION IS COMPLETE.
- THE CONTRACTOR MAY USE MECHANICAL REINFORCING BAR SPLICES IN LIEU OF TENSION LAP SPLICES TO FACILITATE CONSTRUCTION. HOWEVER, NO ADDITIONAL COMPENSATION WILL BE PROVIDED FOR THE USE OF MECHANICAL REINFORCING BAR SPLICES. MECHANICAL REINFORCING BAR SPLICES SHALL BE INSTALLED TO MAKE THIS REINFORCEMENT CONTINUOUS.
- MECHANICAL REINFORCING BAR SPLICES SHALL BE INSTALLED AT STAGE CONSTRUCTION JOINTS FOR ALL TRANSVERSE REINFORCEMENT.



NOTE:

DIMENSIONS SHOWN FOR NORTH ABUTMENT, SOUTH ABUTMENT SIMILAR EXCEPT AS NOTED IN PARENTHESES.

UTILITY DETAILS AT ABUTMENT

SCALE: $\frac{1}{2}$ " = 1'-0"

UTILITY NOTES:

- UTILITY SLEEVES SHALL BE STEEL PIPE CONFORMING TO ASTM A-53, TYPE S, GRADE B, STANDARD WEIGHT, PLAIN ENDS, HOT-DIP GALVANIZED AND SHALL BE SET IN THE FORMS PRIOR TO PLACING ABUTMENT DIAPHRAGM CONCRETE.
- ALL VOID SPACE WITHIN EACH ABUTMENT UTILITY BLOCKOUT SHALL BE FILLED WITH GROUT. THE GROUT SHALL BE LISTED ON THE MASSDOT QUALIFIED CONSTRUCTION MATERIALS PRODUCT LIST.

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
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SHEET 11 OF
25

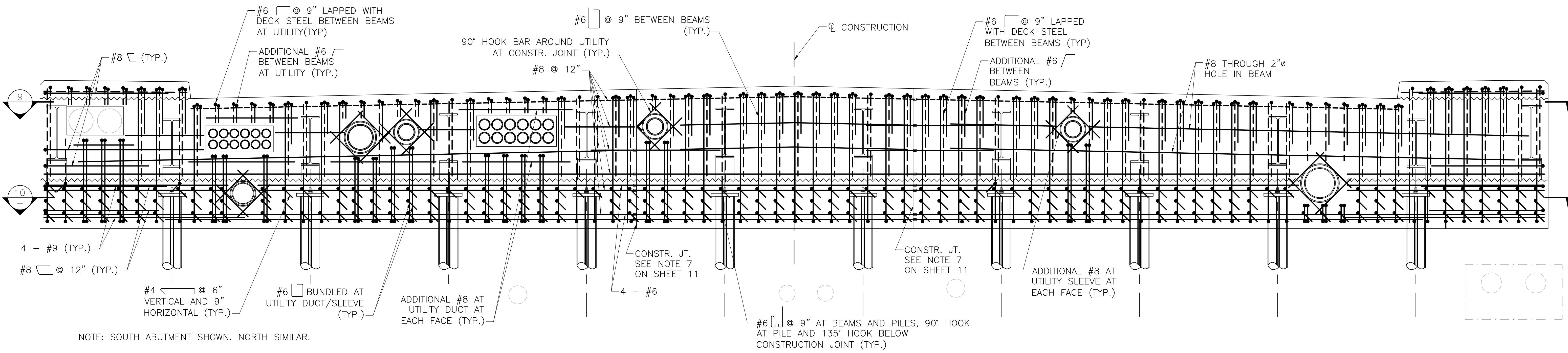


BRIDGE REPLACEMENT
TOWN OF ARLINGTON

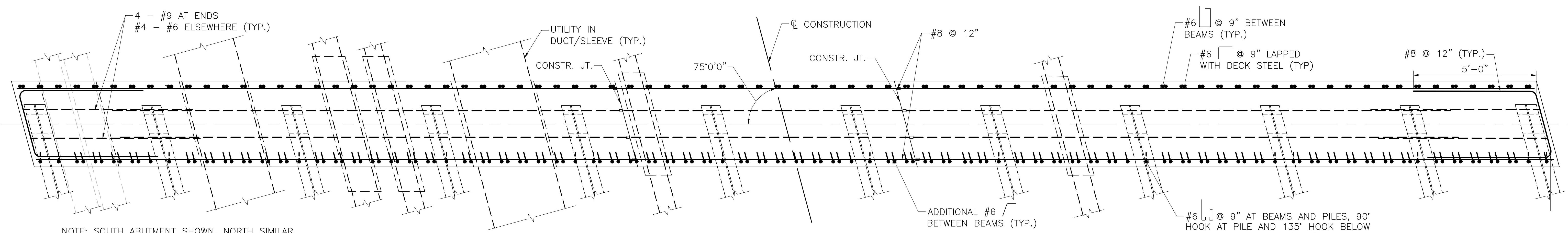
PROPOSED BRIDGE REPLACEMENT
A-10-015 (C10)
US3 (MYSTIC STREET) OVER MILL BROOK

ABUTMENT
DETAILS (2
OF 2)

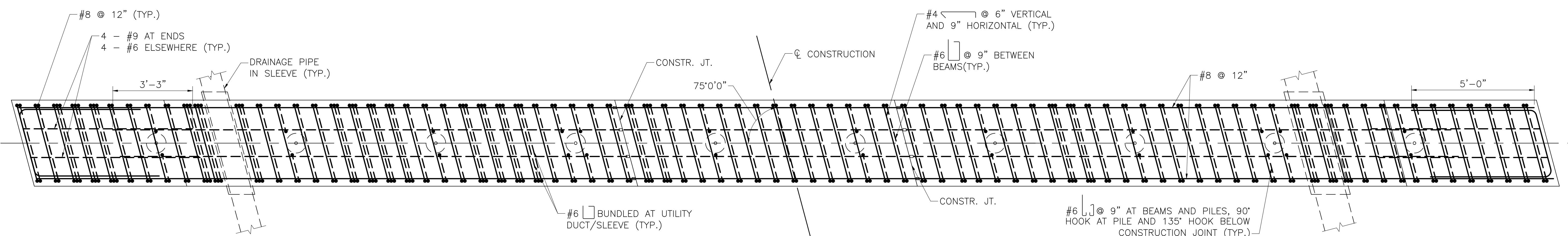
SHEET 12 OF
25



SECTION 8
SCALE: $\frac{1}{2}$ " = 1'-0" 11



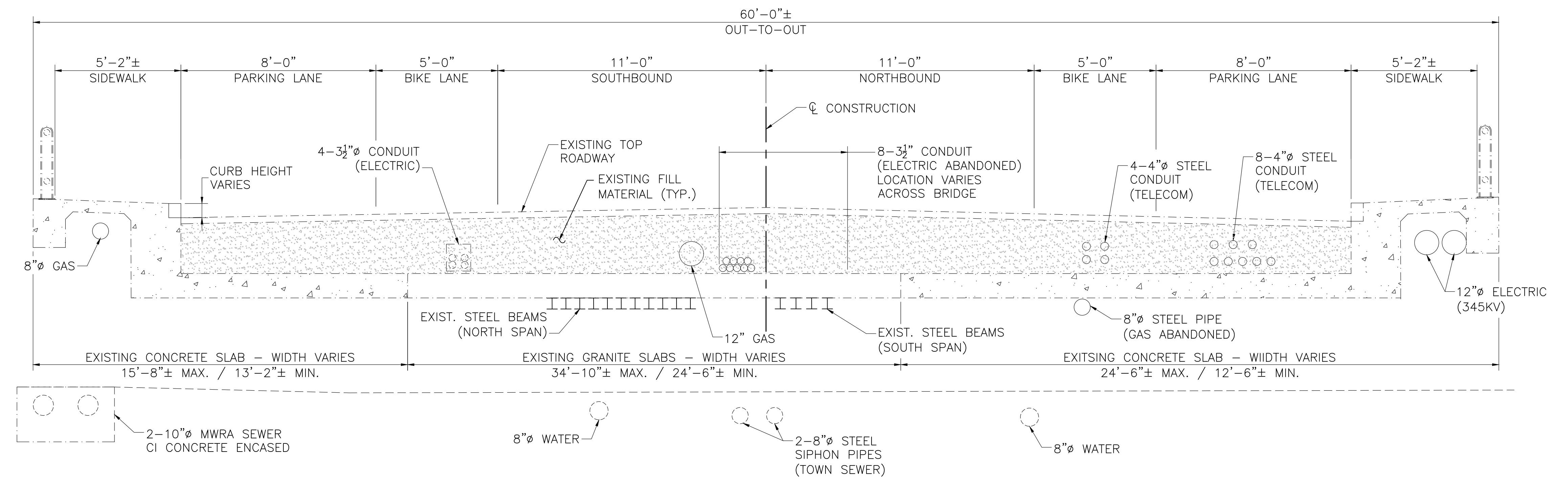
SECTION 8
SCALE: $\frac{1}{2}$ " = 1'-0" 11



SECTION 10
SCALE: $\frac{1}{2}$ " = 1'-0" 11

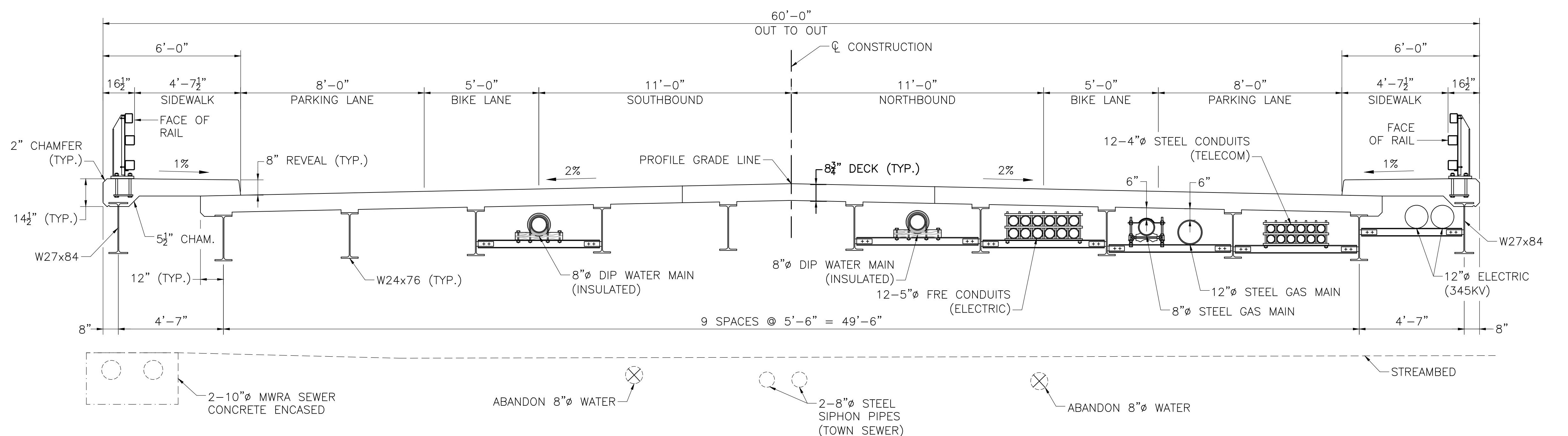
COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
APPROVED UNDER PROVISIONS OF
MASS. GEN. LAWS CH 85 § 35
 8/1/2022
BRIDGE ENGINEER DATE

SHEET 12 OF
25



EXISTING CROSS SECTION

SCALE: $\frac{3}{8}$ " = 1'-0"



PROPOSED CROSS SECTION

SCALE: $\frac{3}{8}$ " = 1'-0"

BRIDGE REPLACEMENT

TOWN OF ARLINGTON

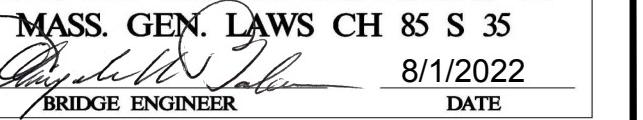
PROPOSED BRIDGE REPLACEMENT

A-10-015 (C10)

US3 (MYSTIC STREET) OVER MILL BROOK

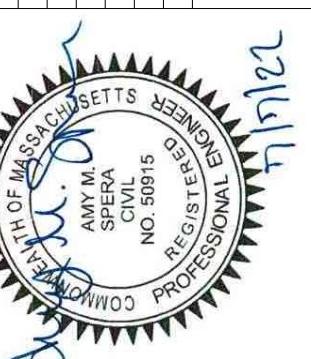
CROSS
SECTIONS

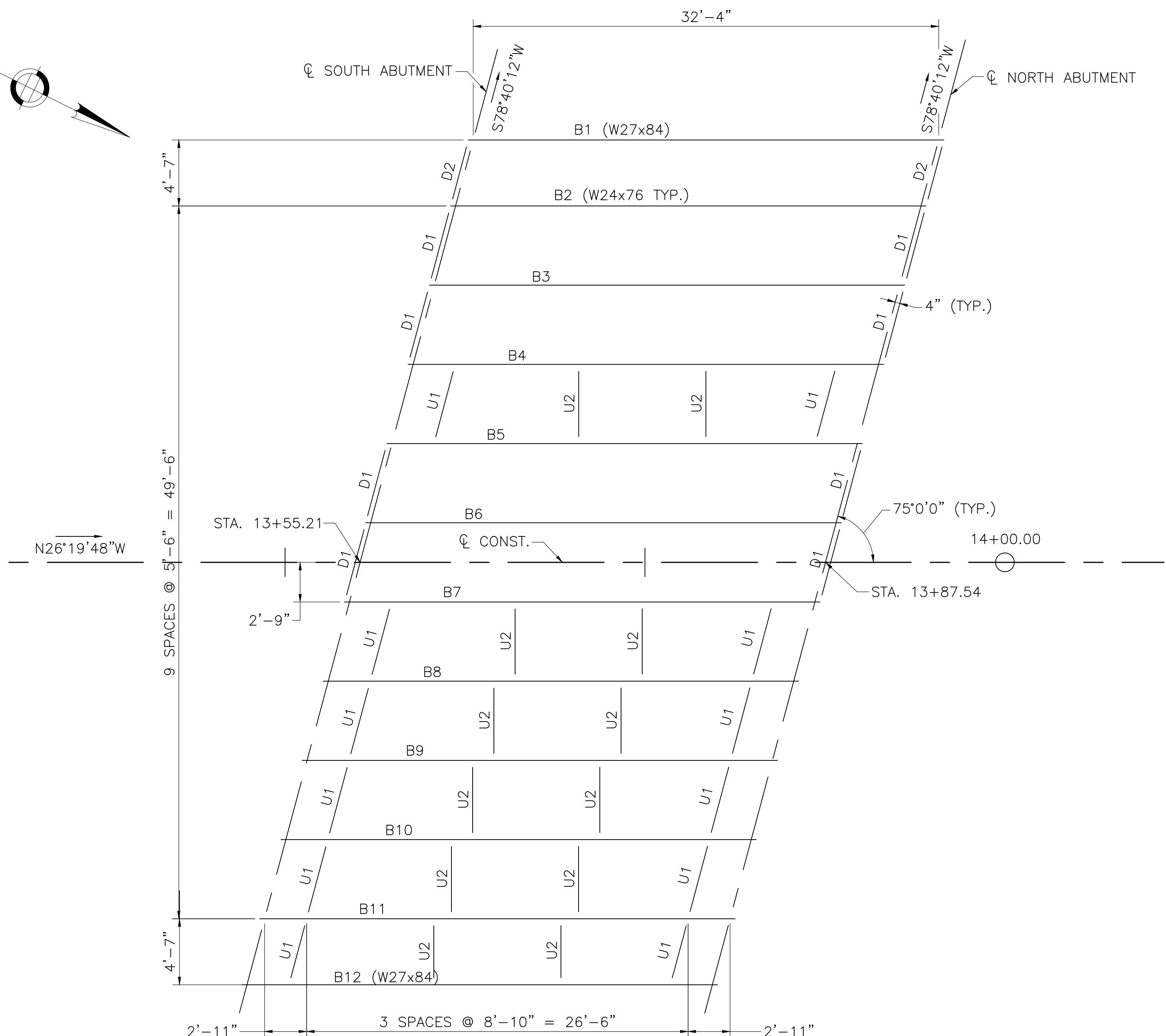
SHEET 13 OF
25

COMMONWEALTH OF MASSACHUSETTS
MassDOT, Highway Division
APPROVED UNDER PROVISIONS OF
MASS. GEN. LAWS CH 85 § 35

8/1/2022
BRIDGE ENGINEER
DATE

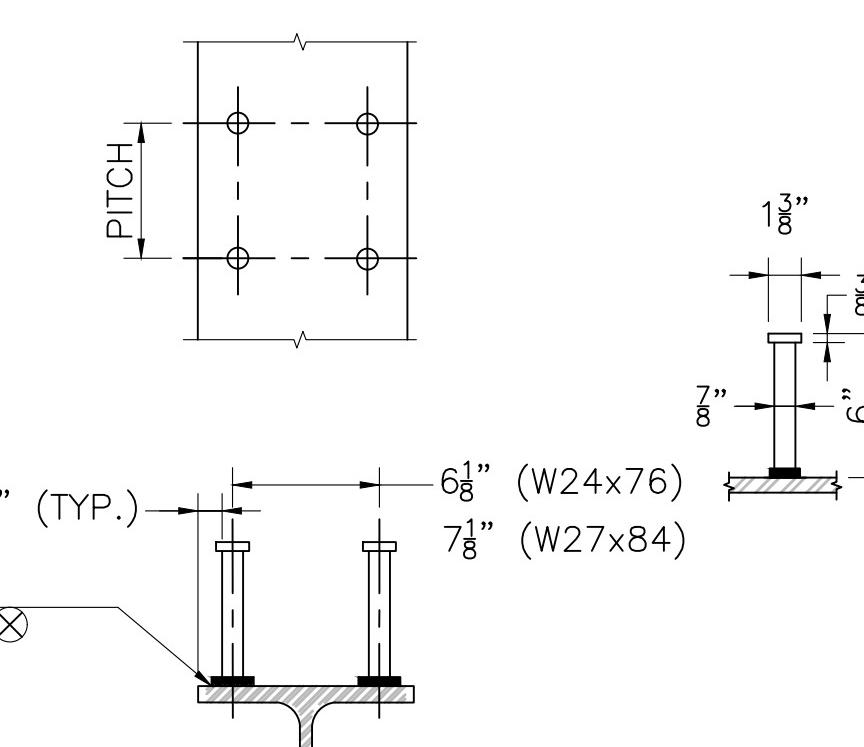
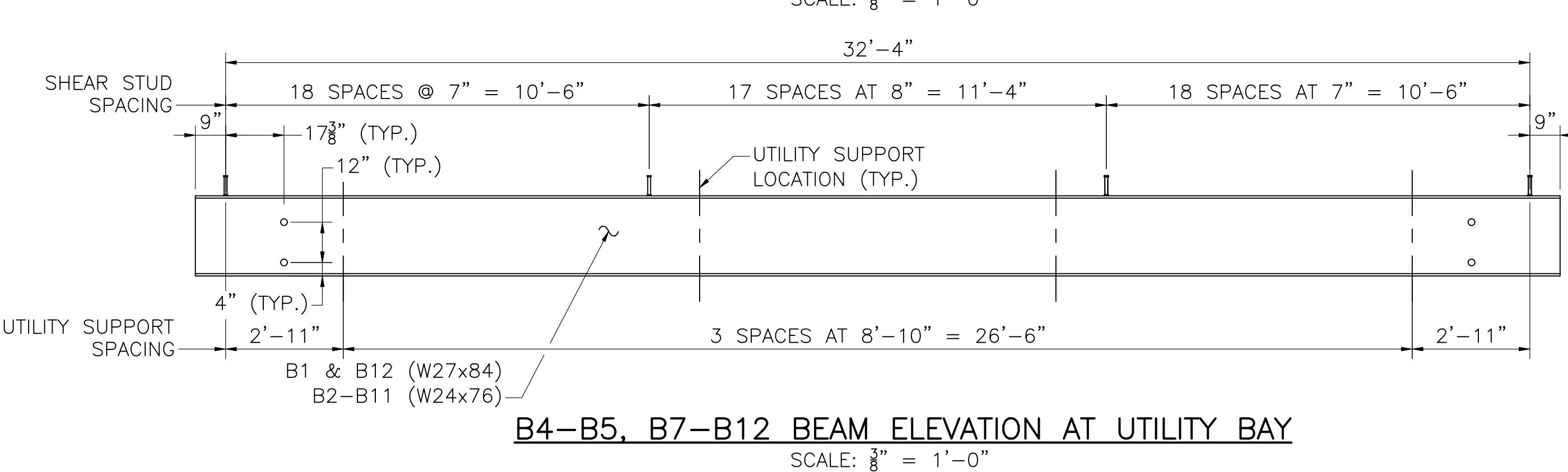
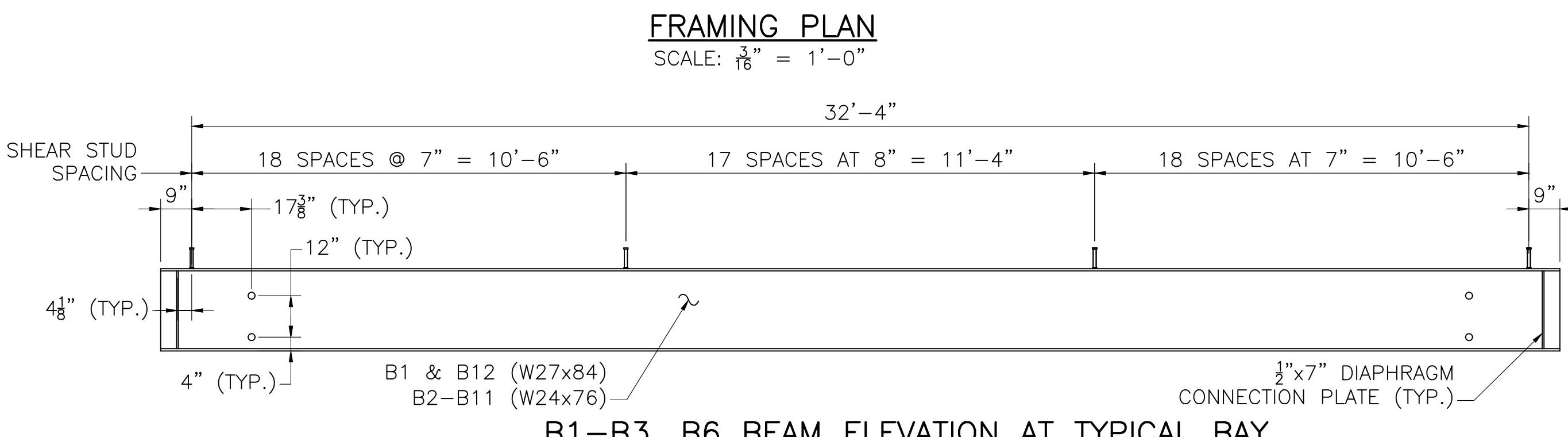
DATE	DRW BY	CALC. BY	APPRV. BY	DESCRIPTION
07/07/2022	FB	FB	AMS	ISSUED FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER _____ DATE _____





CAMBER TABLE (INCHES)												
STRINGER NO.		SPAN NO. 1										
		C. BRG. S. ABUT.	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	C. BRG. N. ABUT.
B1 - B2	STEEL DL DEFLECTION	0.000	0.010	0.018	0.025	0.029	0.031	0.029	0.025	0.018	0.010	0.000
	CONC. DL DEFLECTION	0.000	0.054	0.102	0.139	0.163	0.171	0.163	0.139	0.102	0.054	0.000
	S.D.L. DEFLECTION	0.000	0.006	0.011	0.015	0.018	0.019	0.018	0.015	0.011	0.006	0.000
	VERT. CURVE CAMBER	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	ADDITIONAL CAMBER	0.000	0.127	0.240	0.329	0.385	0.404	0.385	0.329	0.240	0.127	0.000
B3 - B10	TOTAL CAMBER	0.000	0.196	0.371	0.508	0.595	0.625	0.595	0.508	0.371	0.196	0.000
	STEEL DL DEFLECTION	0.000	0.044	0.084	0.115	0.135	0.142	0.135	0.115	0.084	0.044	0.000
	CONC. DL DEFLECTION	0.000	0.077	0.147	0.201	0.235	0.247	0.235	0.201	0.147	0.077	0.000
	S.D.L. DEFLECTION	0.000	0.002	0.004	0.005	0.006	0.007	0.006	0.005	0.004	0.002	0.000
	VERT. CURVE CAMBER	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
B11 - B12	ADDITIONAL CAMBER	0.000	0.127	0.240	0.329	0.385	0.404	0.385	0.329	0.240	0.127	0.000
	TOTAL CAMBER	0.000	0.251	0.475	0.650	0.761	0.799	0.761	0.650	0.475	0.251	0.000



SHEAR STUD CONNECTORS
NOT TO SCALE

- FRAMING NOTES:**
1. D1 = TYPICAL END DIAPHRAGM
D2 = END DIAPHRAGM UNDER SIDEWALK
 2. U1 = TYPICAL END UTILITY SUPPORT
U2 = TYPICAL INTERMEDIATE UTILITY SUPPORT
 3. SEE SHEET 15 FOR DIAPHRAGM AND UTILITY SUPPORT DETAILS.
 4. THE MAIN LOAD CARRYING MEMBERS ARE STRINGERS B1-B12.
 5. ALL STEEL SHALL CONFORM TO AASHTO M270 GRADE 50.

COMMONWEALTH OF MASSACHUSETTS
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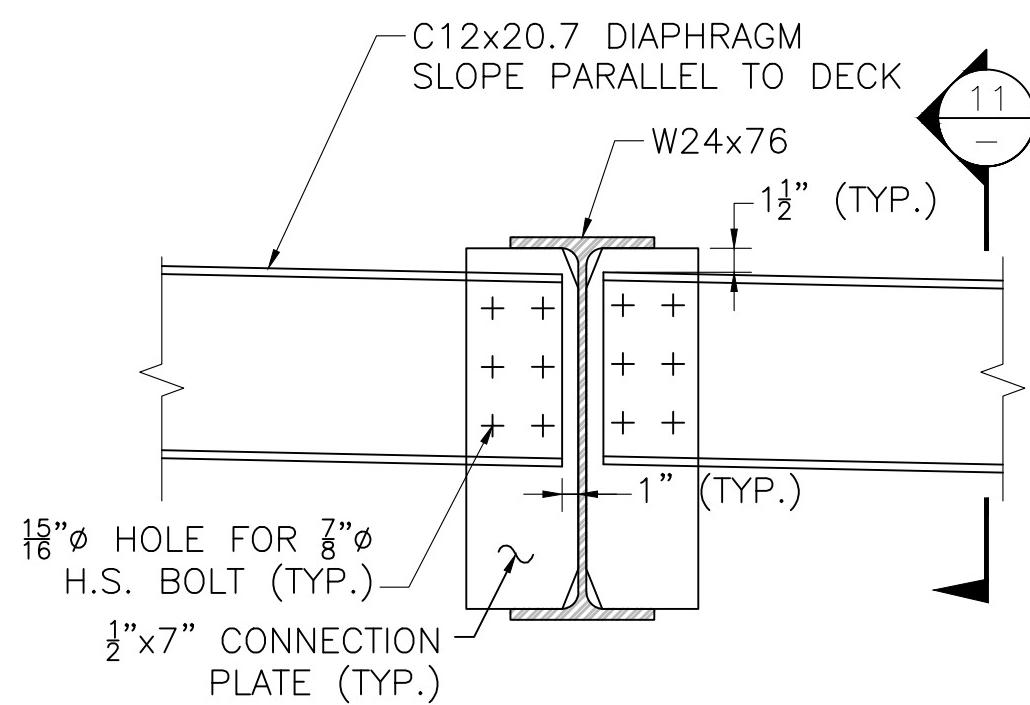


BRIDGE REPLACEMENT
TOWN OF ARLINGTON

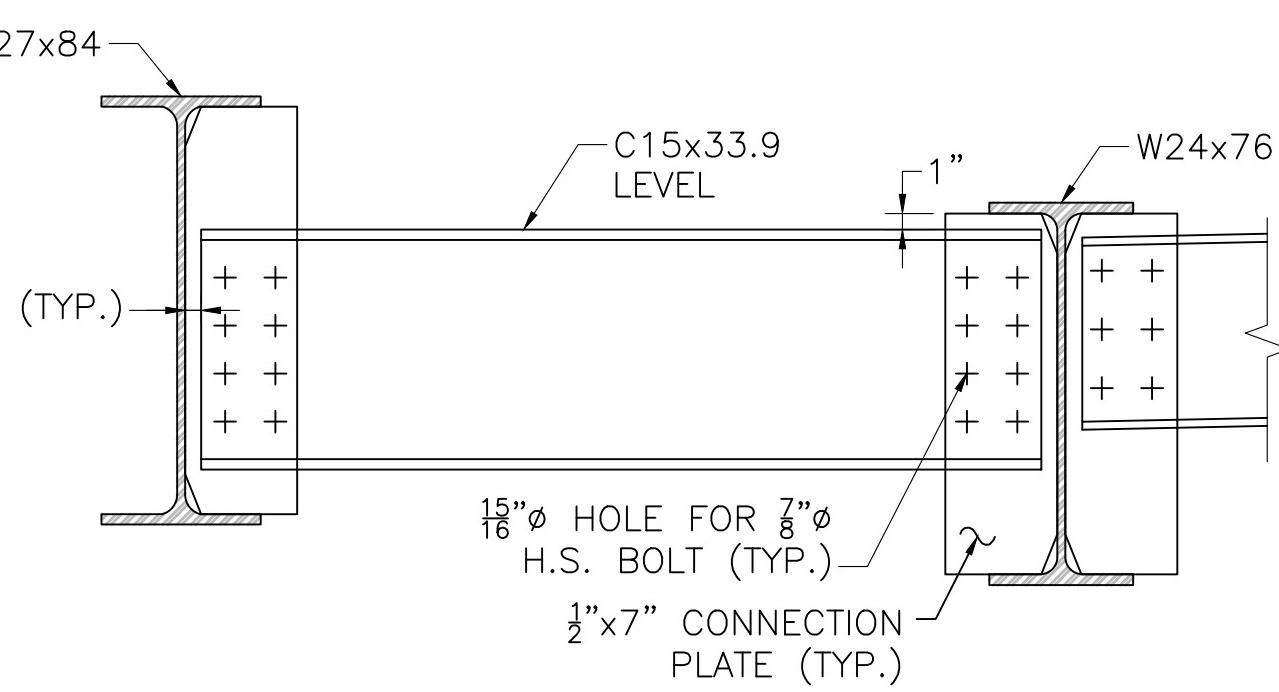
PROPOSED BRIDGE REPLACEMENT
A-10-015 (C10)
US3 (MYSTIC STREET) OVER MILL BROOK

STEEL DETAILS

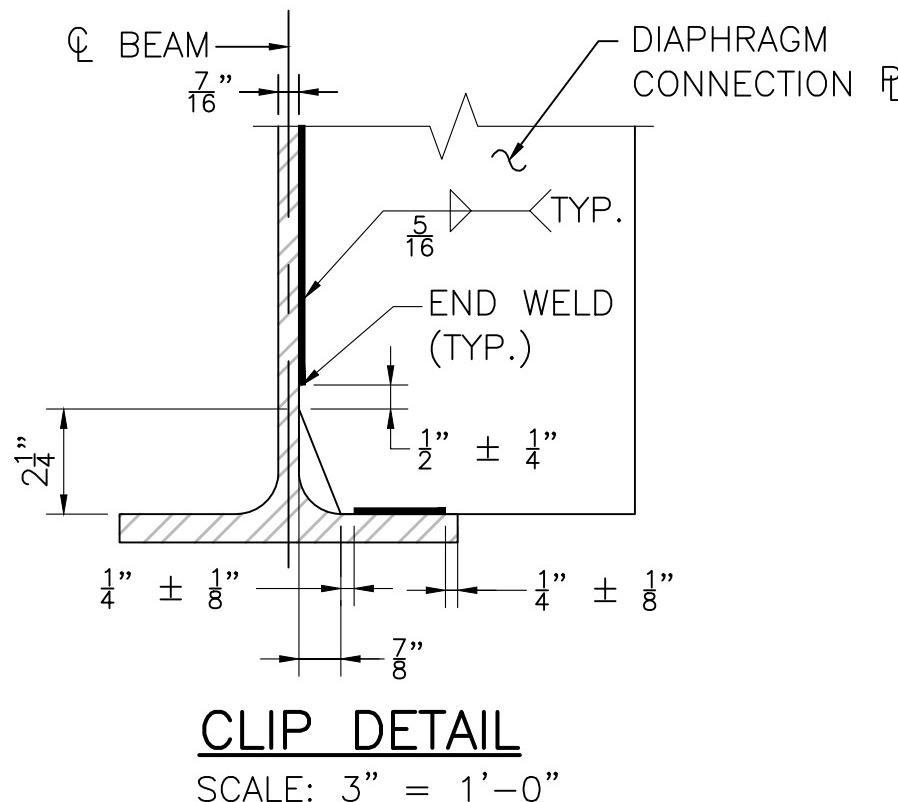
SHEET 15 OF
25



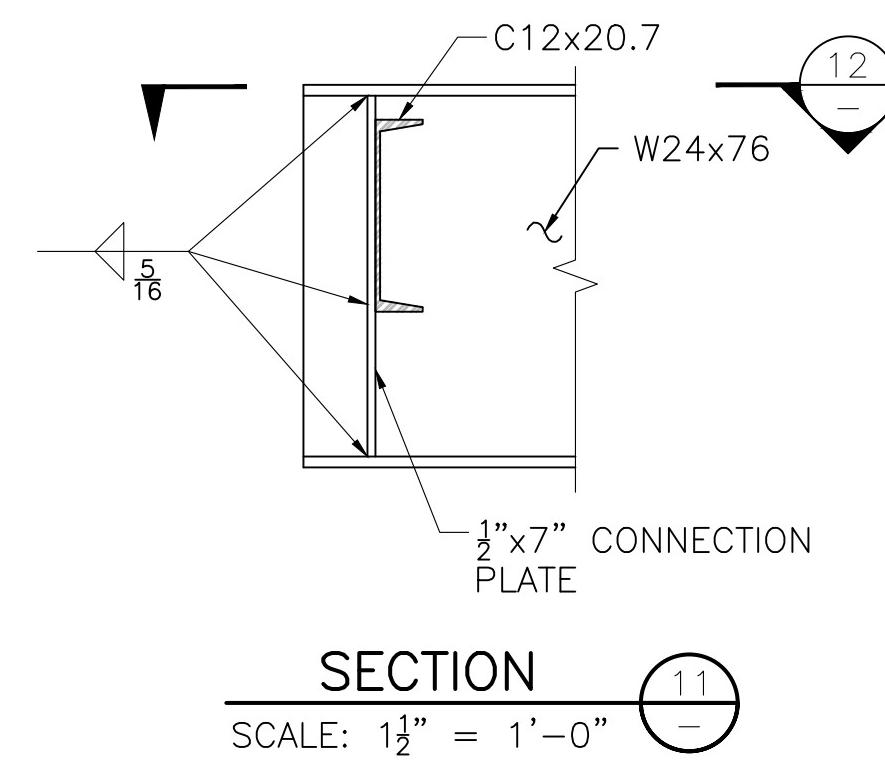
TYPICAL END DIAPHRAGM - D1
SCALE: 1" = 1'-0"



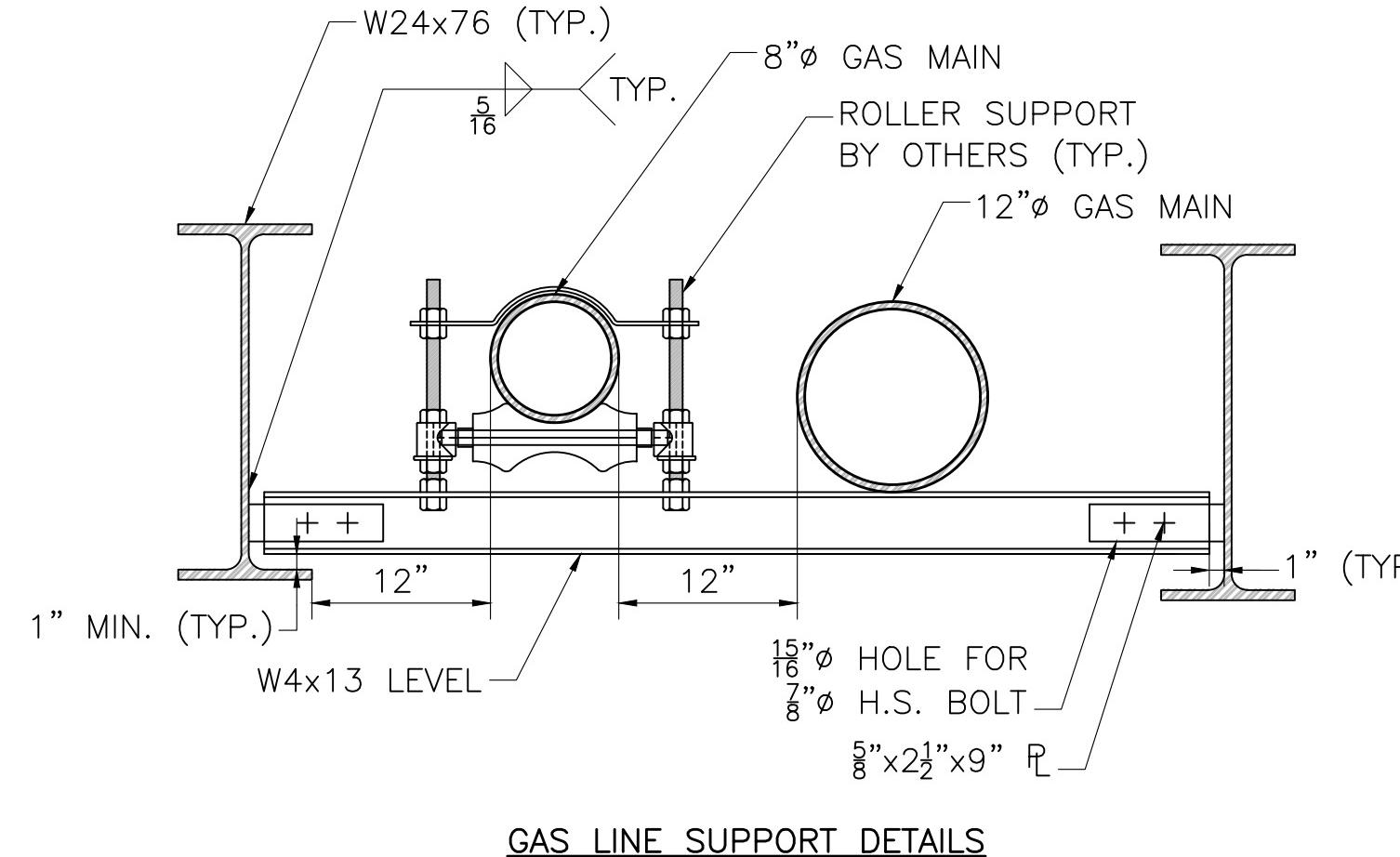
END DIAPHRAGM UNDER SIDEWALK - D2
SCALE: 1" = 1'-0"



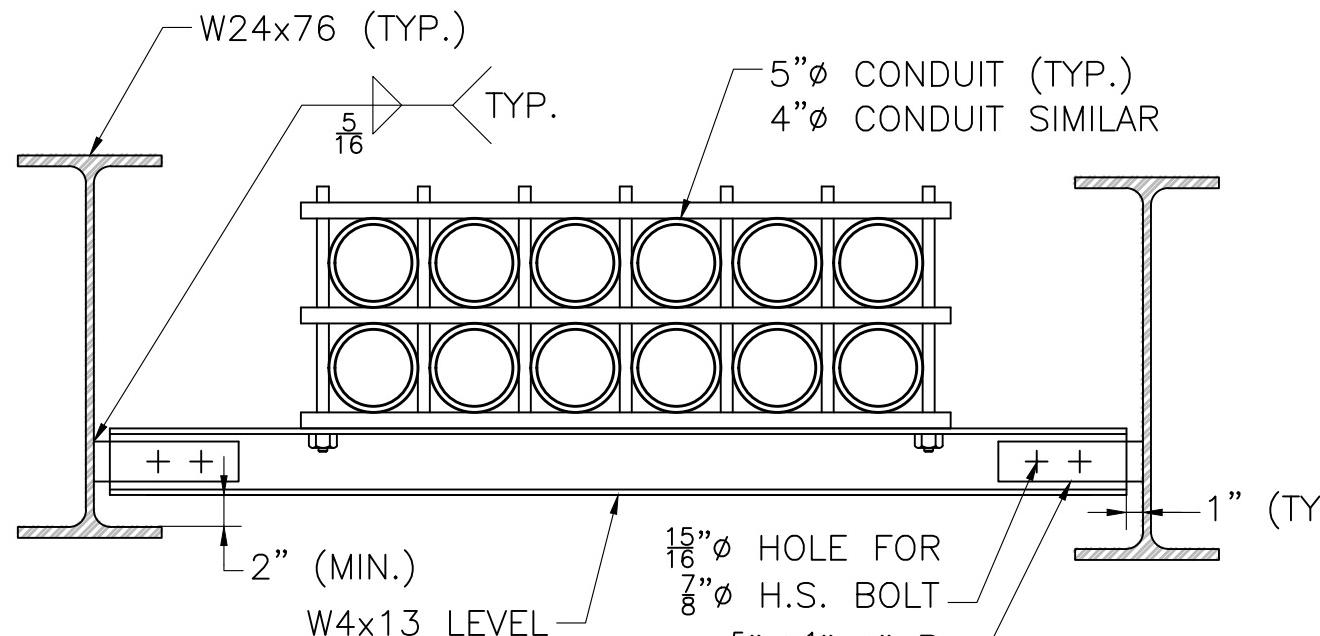
CLIP DETAIL
SCALE: 1 1/2" = 1'-0"



SECTION I-12
SCALE: 1 1/2" = 1'-0"



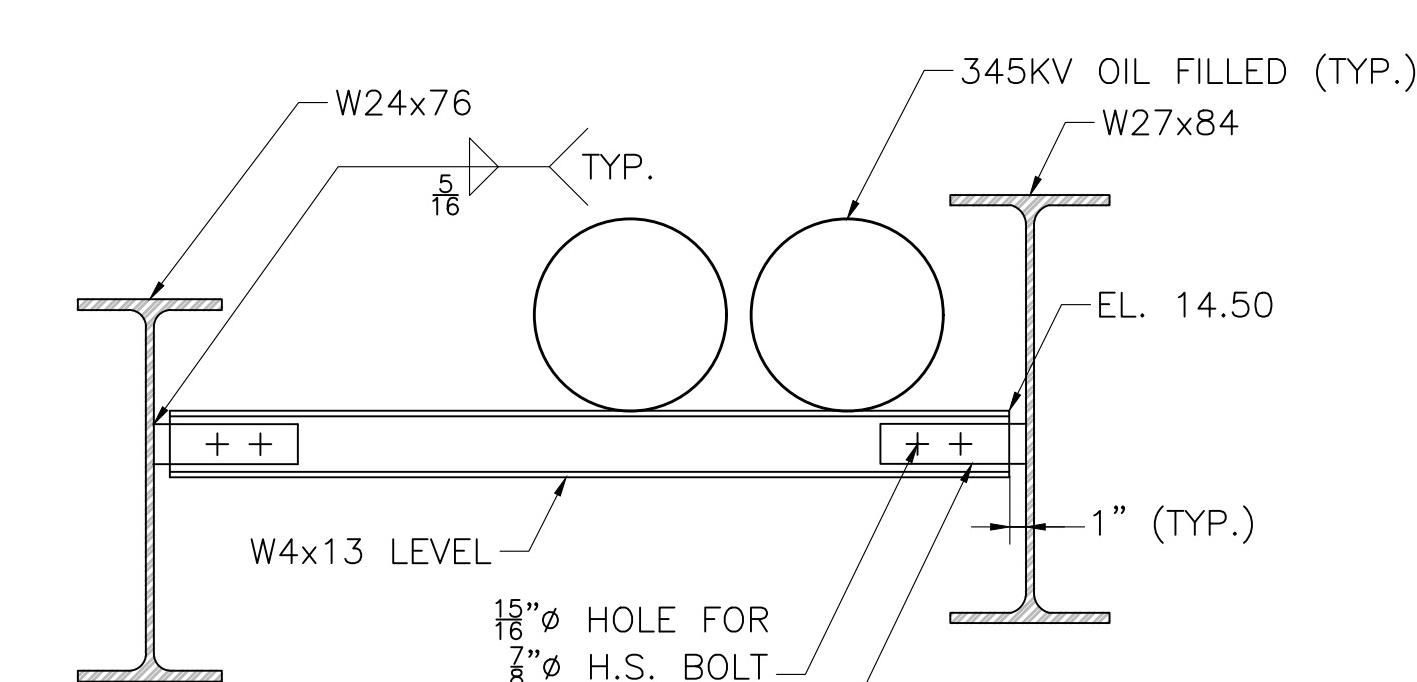
GAS LINE SUPPORT DETAILS



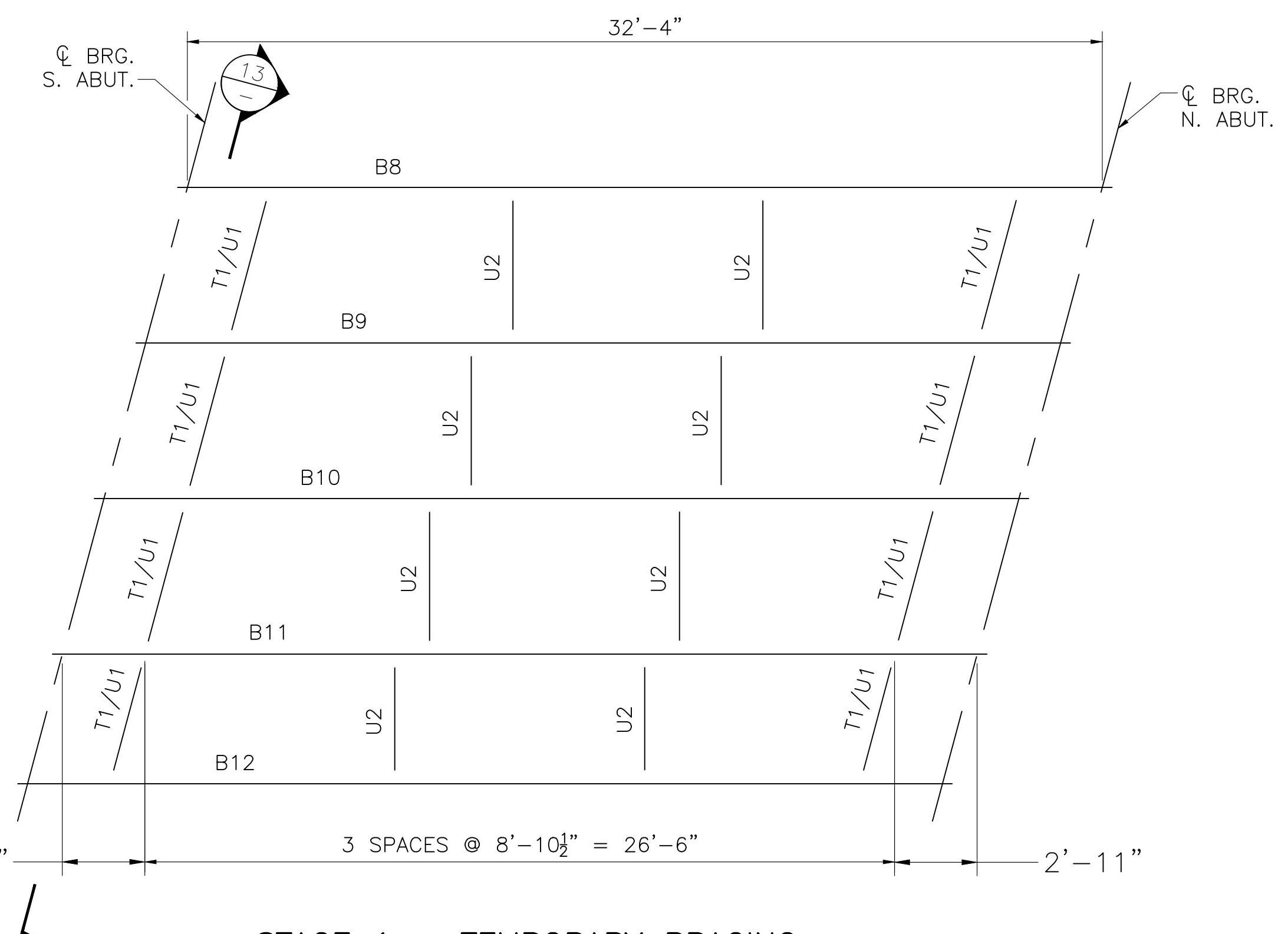
ELECTRICAL & TELECOM CONDUITS SUPPORT DETAILS

UTILITY SUPPORT - U1/U2

SCALE: 1" = 1'-0"

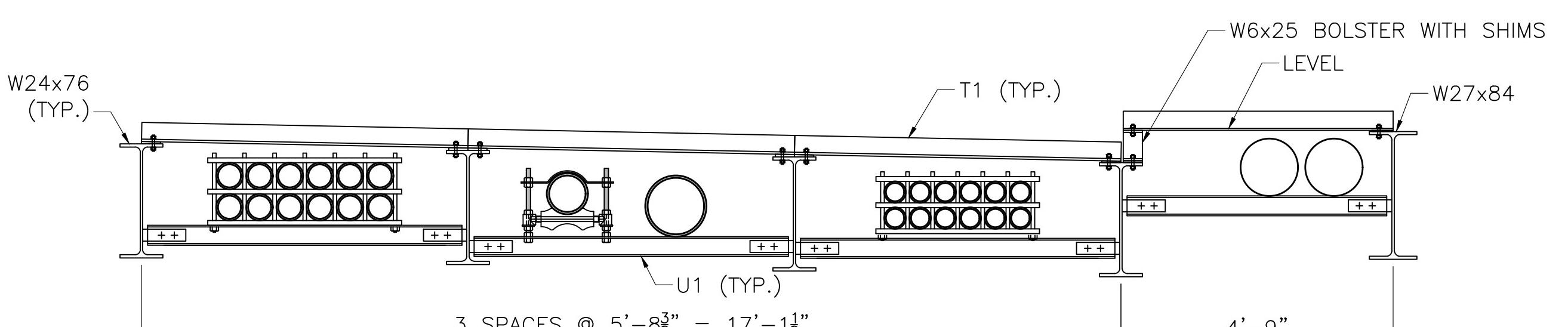


345KV ELECTRIC SUPPORT DETAILS

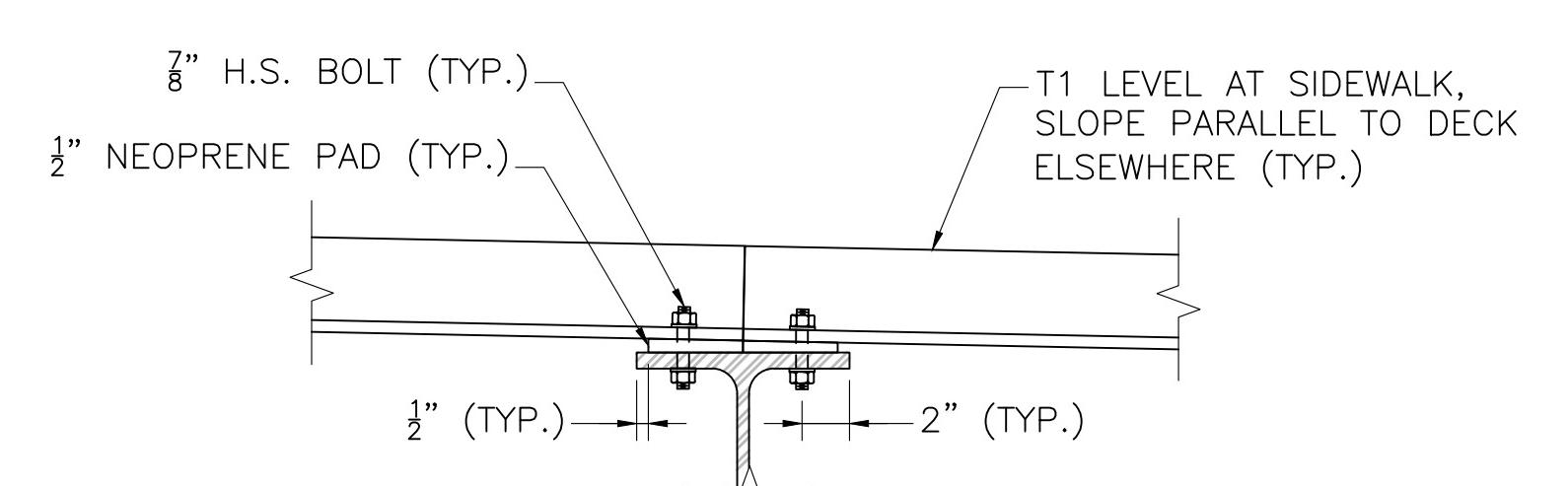


STAGE 1 - TEMPORARY BRACING

SCALE: 1/4" = 1'-0"



SECTION I-13
SCALE: 1/2" = 1'-0"

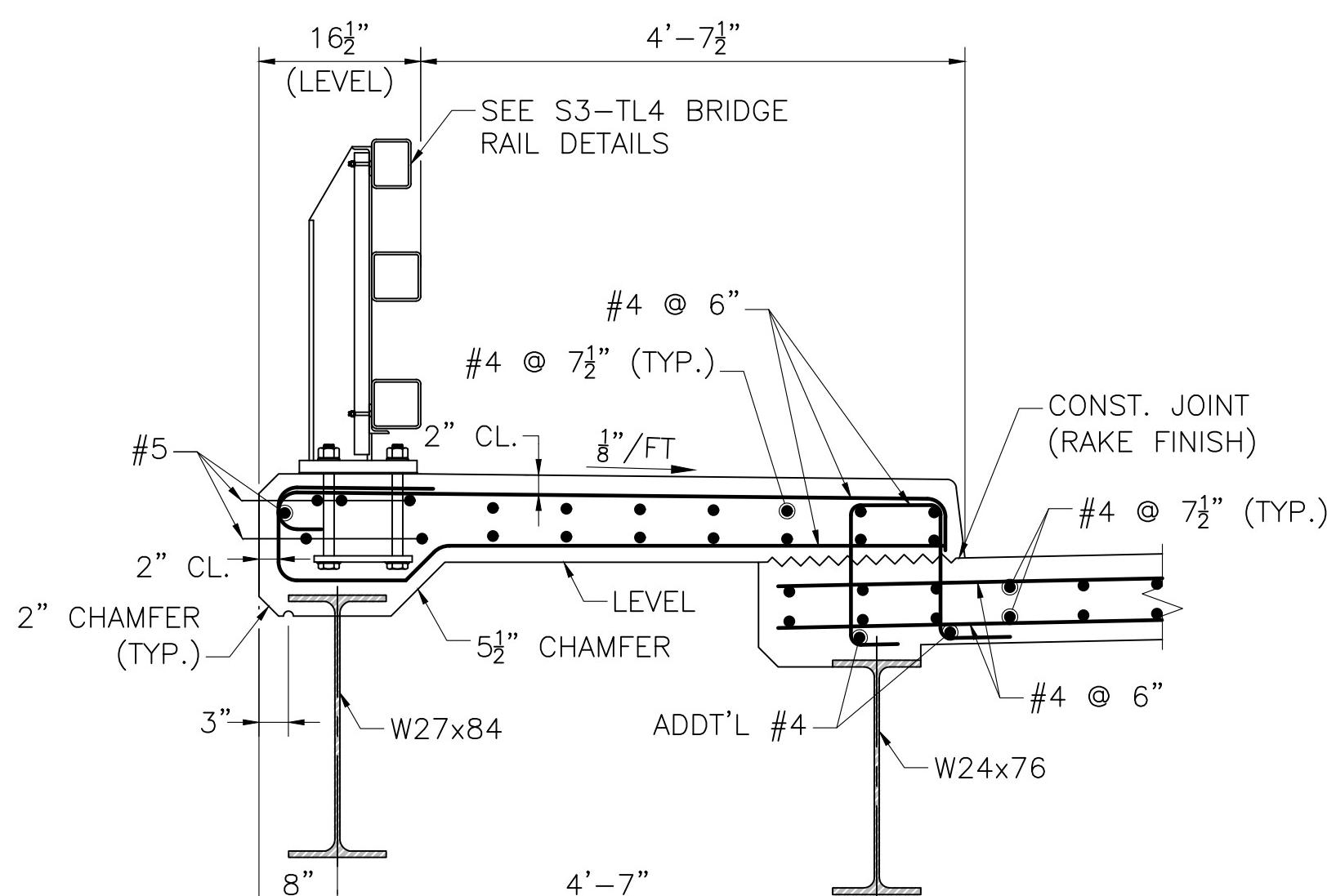


TEMPORARY BRACING DETAILS

SCALE: 1 1/2" = 1'-0"

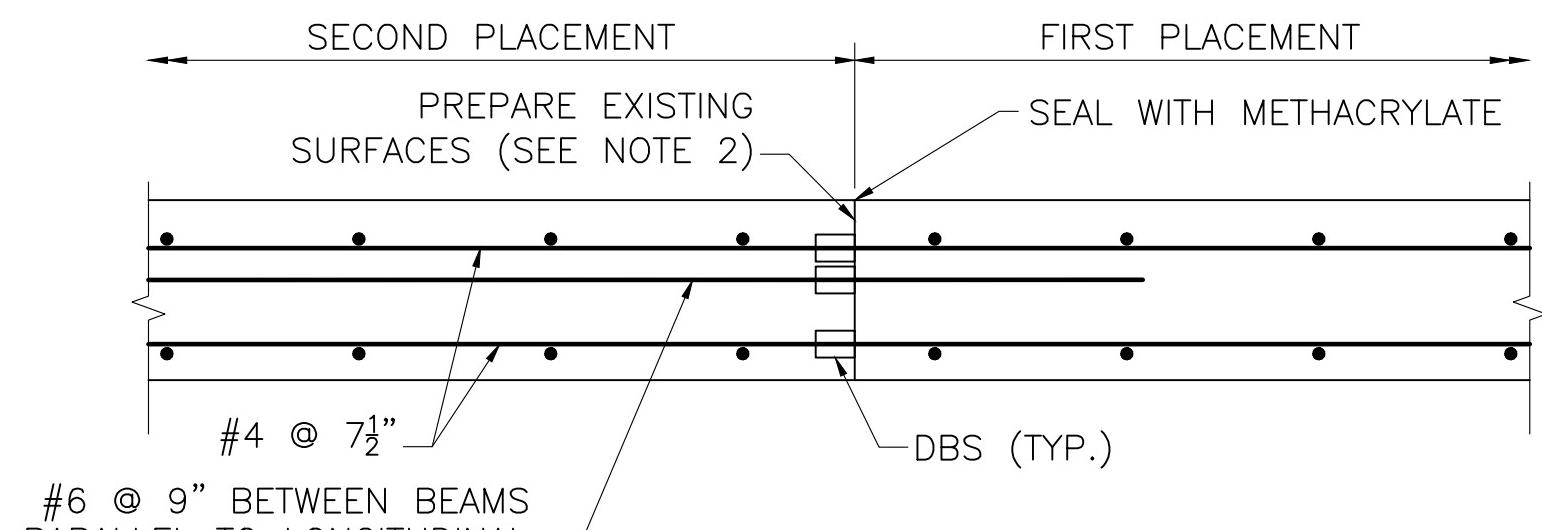
TEMPORARY BRACING NOTES:

1. T1 = WT4x12 TEMPORARY BRACING MAY BE LEFT IN PLACE.
U1 = W4x13 UTILITY SUPPORT (PERMANENT)
2. ALL STEEL SHALL CONFORM TO AASHTO M270 GRADE 50 AND SHALL BE HOT DIP GALVANIZED.
3. THE TEMPORARY BRACING IS REQUIRED DURING CONSTRUCTION STAGE 1 TO BRACE THE BEAM DURING THE FIRST DECK POUR. THE TEMPORARY BRACING SHALL BE LEFT IN PLACE FOR AT LEAST 72 HOURS AFTER THE COMPLETION OF THE FIRST STAGE 1 DECK POUR.



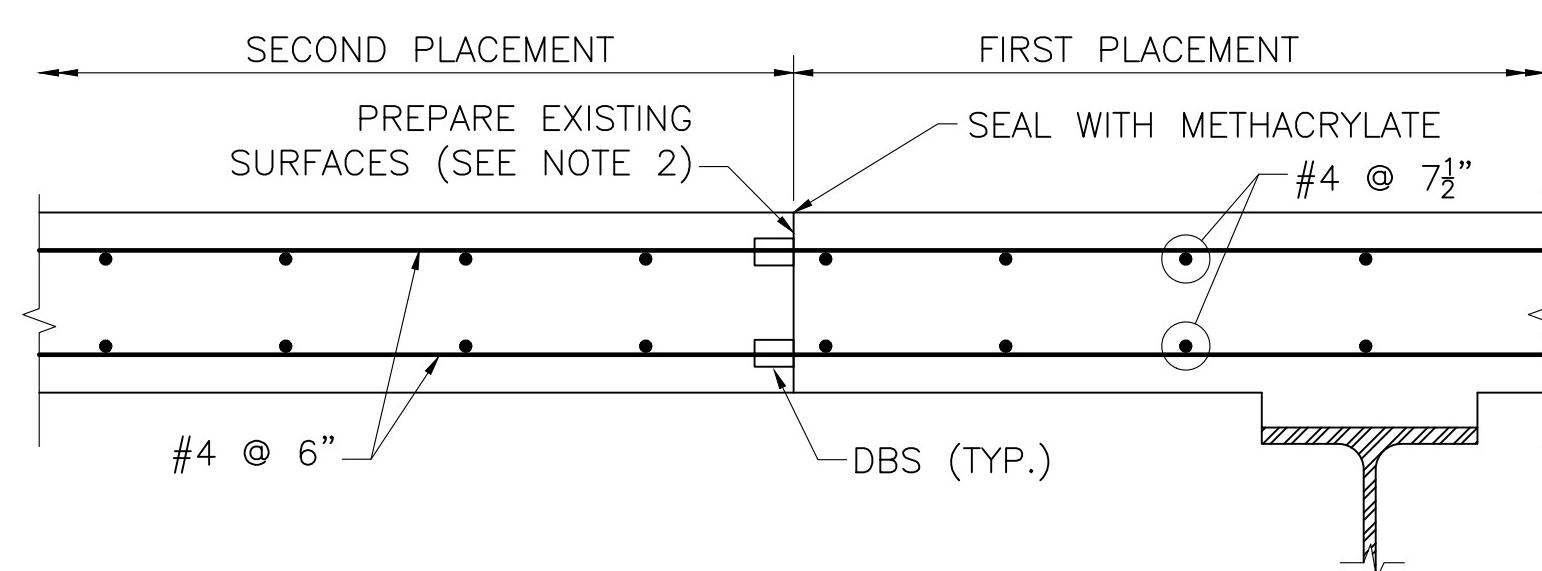
SIDEWALK REINFORCEMENT

SCALE: $\frac{3}{4}$ " = 1'-0"



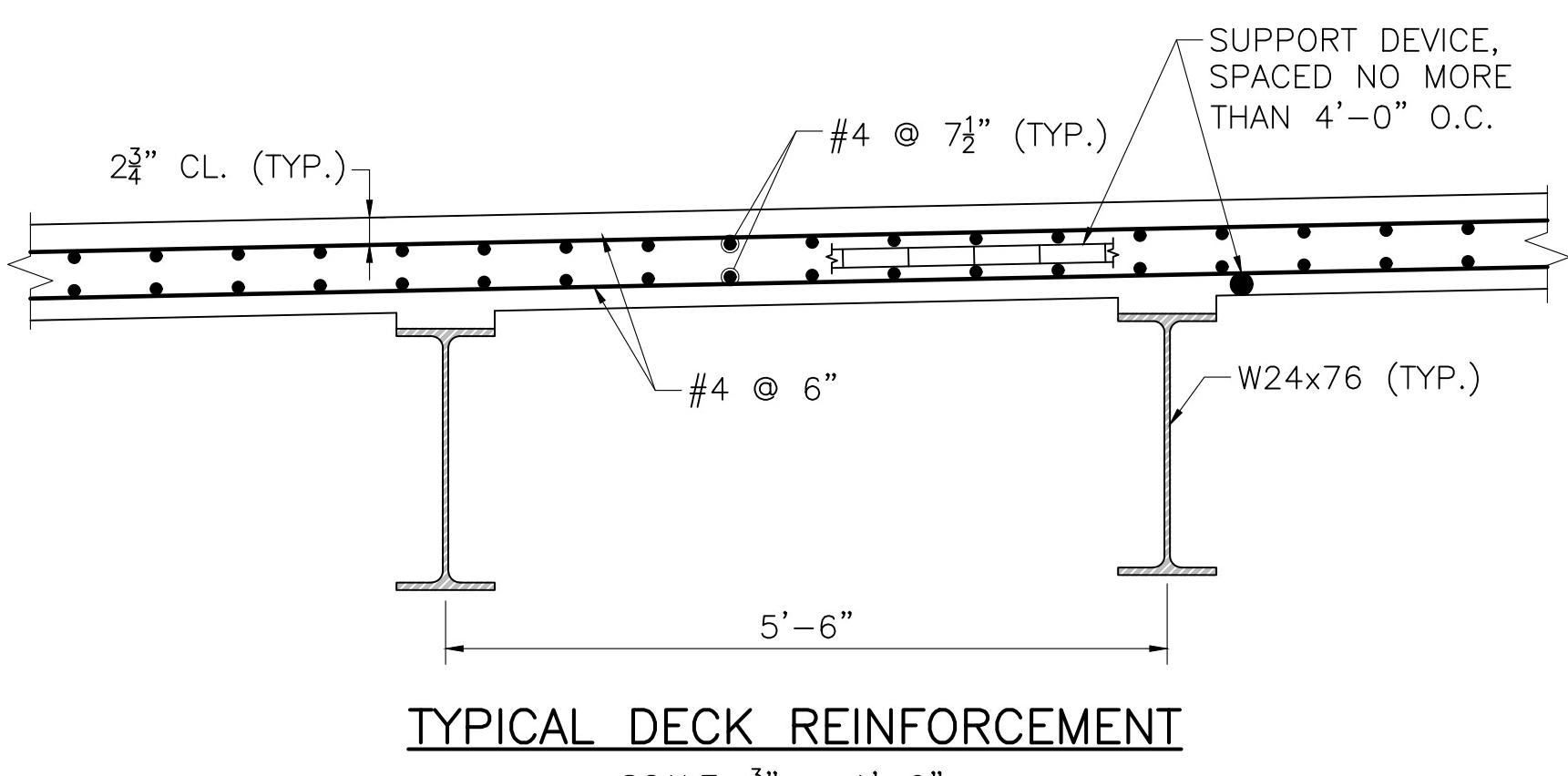
TRANSVERSE CONSTRUCTION JOINT DETAIL IN DECK SLAB

SCALE: 1½" = 1'-0"



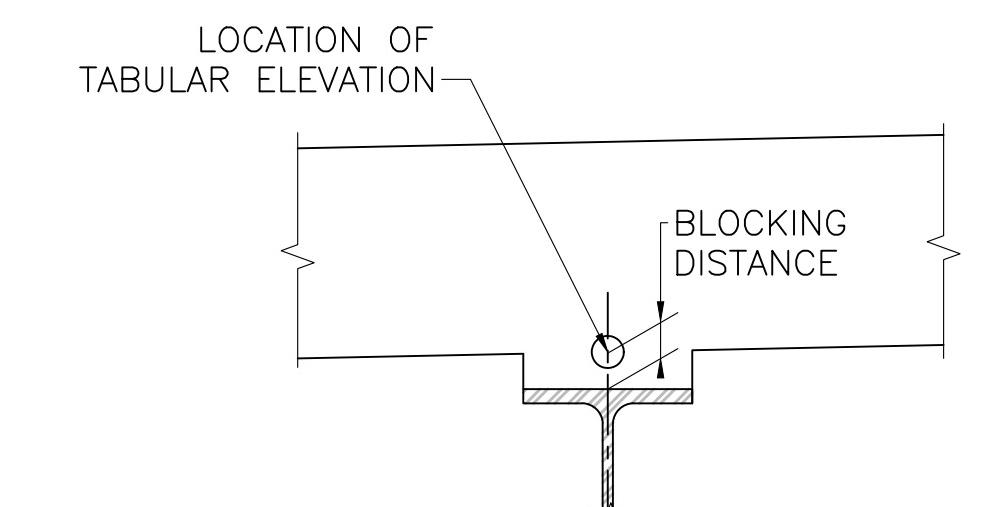
LONGITUDINAL CONSTRUCTION JOINT DETAIL IN DECK SLAB

SCALE: 1½" = 1'-0"



TYPICAL DECK REINFORCEMENT

SCALE: $\frac{3}{4}$ " = 1'-0"

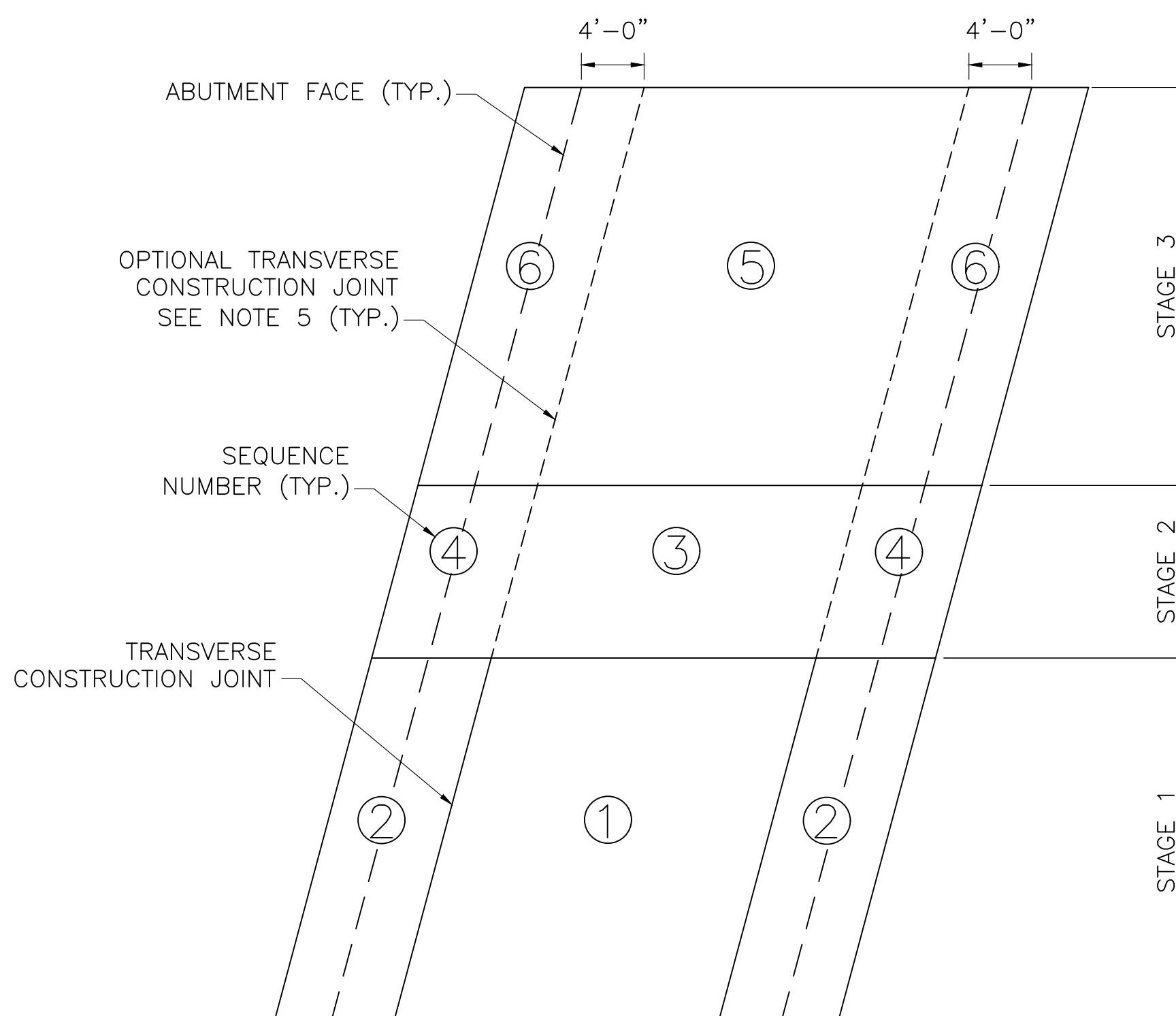


NOTE:

AFTER THE BEAMS ARE ERECTED BUT BEFORE THE FORMS ARE BUILT, ELEVATIONS ON TOP OF THE FLANGE OF THE BEAMS ARE TO BE OBTAINED AT THE POINTS INDICATED IN THE TABLE. THE DIFFERENCE BETWEEN THE ELEVATIONS OBTAINED AND THOSE SHOWN IN THE TABLE GIVES THE ACTUAL BLOCKING DISTANCE FROM THE TOP OF BEAM TO THE BOTTOM OF THE SLAB AT CENTER LINE OF BEAM.

HAUNCH DETAIL TOP OF FORM DETAILS

NOT TO SCALE



DECK PLACEMENT SEQUENCE

SCALE: 1" = 100'-0"

STRINGER NO.	TOP OF FORM ELEVATIONS FOR DECK SLAB PRIOR TO PLACEMENT OF CONCRETE				
	INCREASING STATIONS				
	Q BRG. S. ABUT.	¼ PT.	½ PT.	¾ PT.	Q BRG. N. ABUT.
B1	15.73	15.69	15.65	15.60	15.55
B2	15.01	14.97	14.93	14.88	14.83
B3	15.13	15.10	15.06	15.01	14.95
B4	15.25	15.22	15.18	15.13	15.07
B5	15.37	15.34	15.31	15.25	15.20
B6	15.50	15.47	15.43	15.38	15.32
B7	15.50	15.47	15.44	15.39	15.33
B8	15.40	15.37	15.33	15.28	15.22
B9	15.29	15.26	15.22	15.17	15.11
B10	15.18	15.16	15.12	15.07	15.01
B11	15.08	15.04	15.00	14.96	14.90
B12	15.81	15.78	15.74	15.69	15.64

COMMONWEALTH OF MASSACHUSETTS
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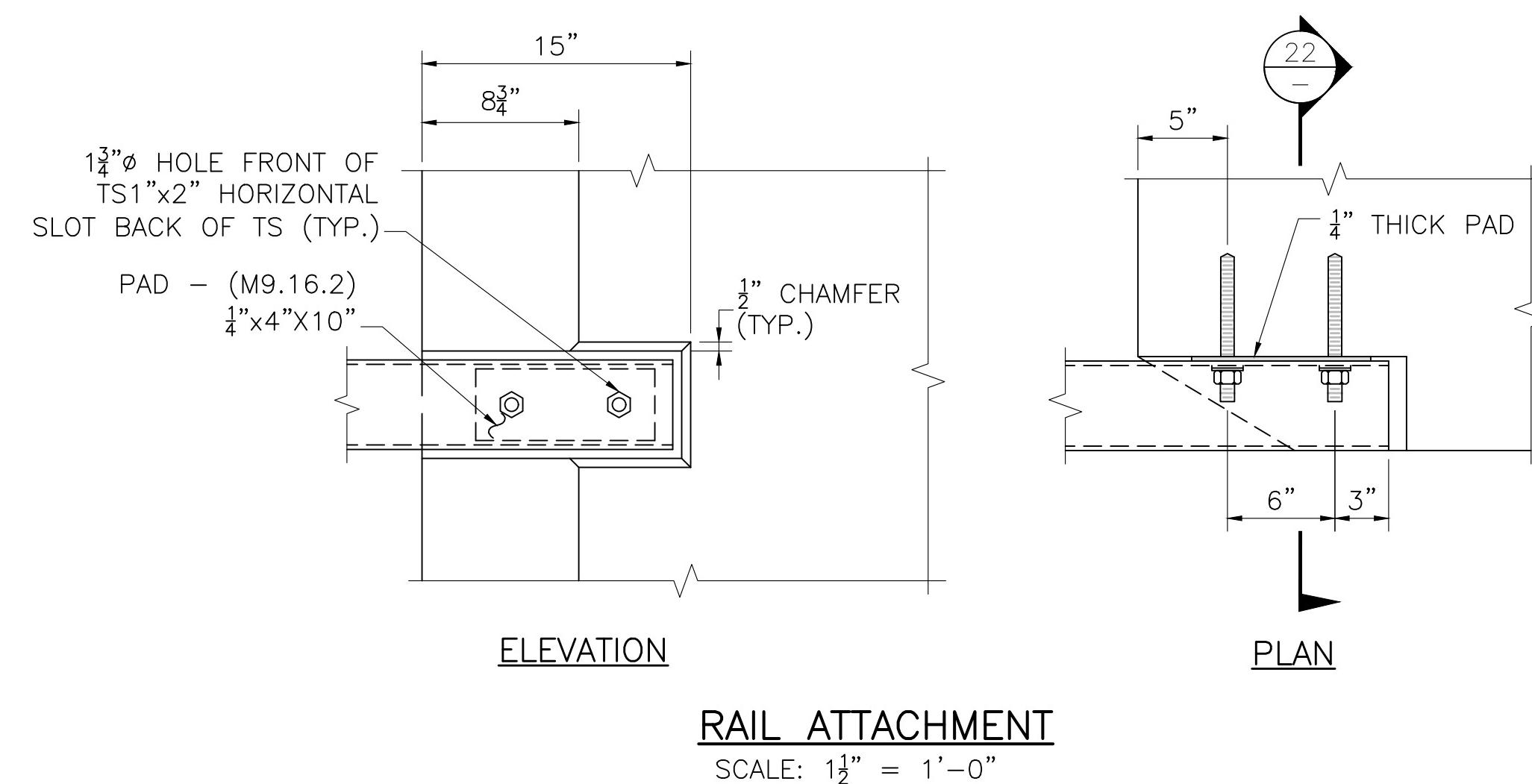
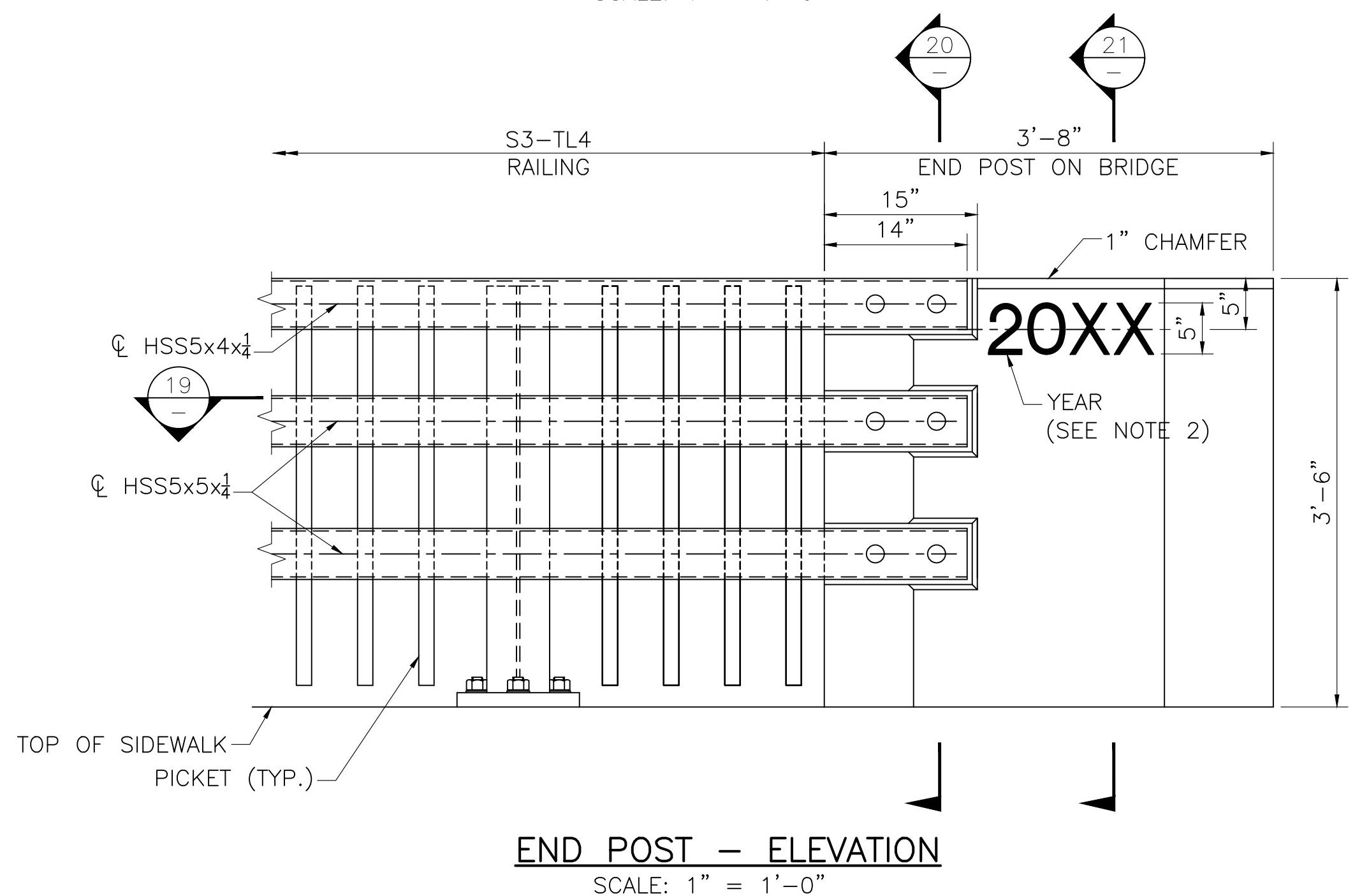
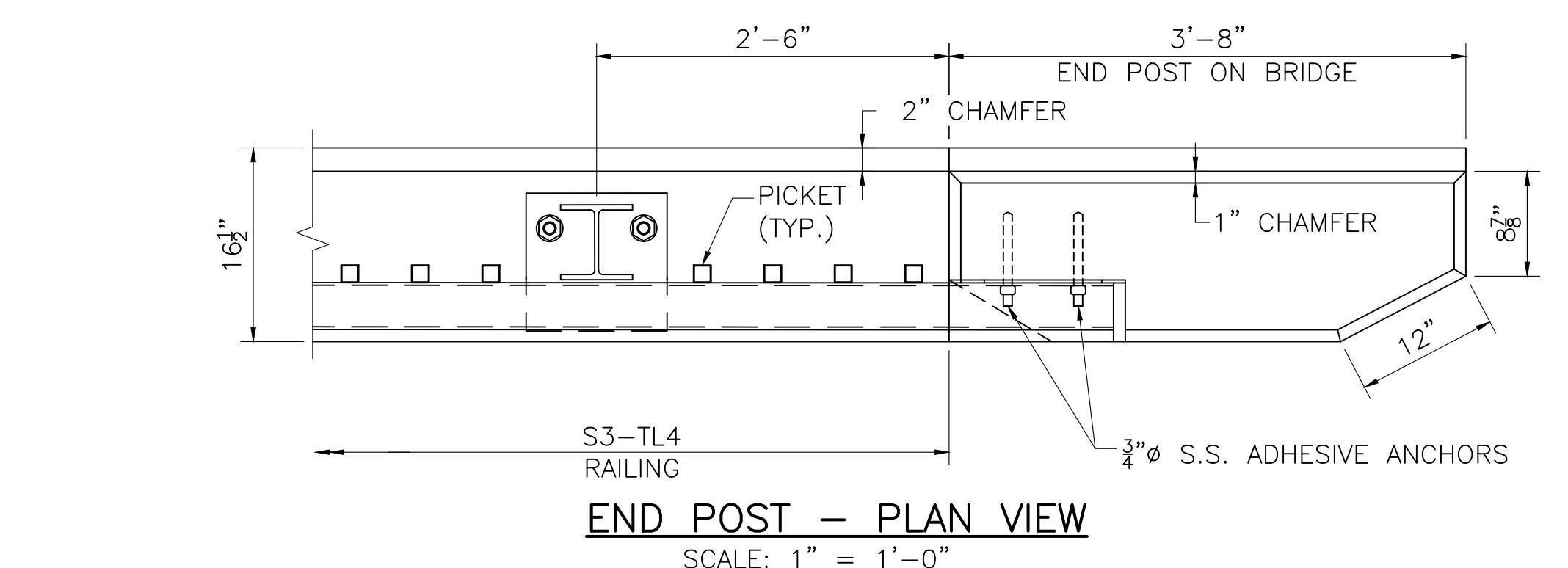
BRIDGE REPLACEMENT TOWN OF ARLINGTON

PROPOSED BRIDGE REPLACEMENT
A-10-015 (C10)
US3 (MYSTIC STREET) OVER MILL BROOK

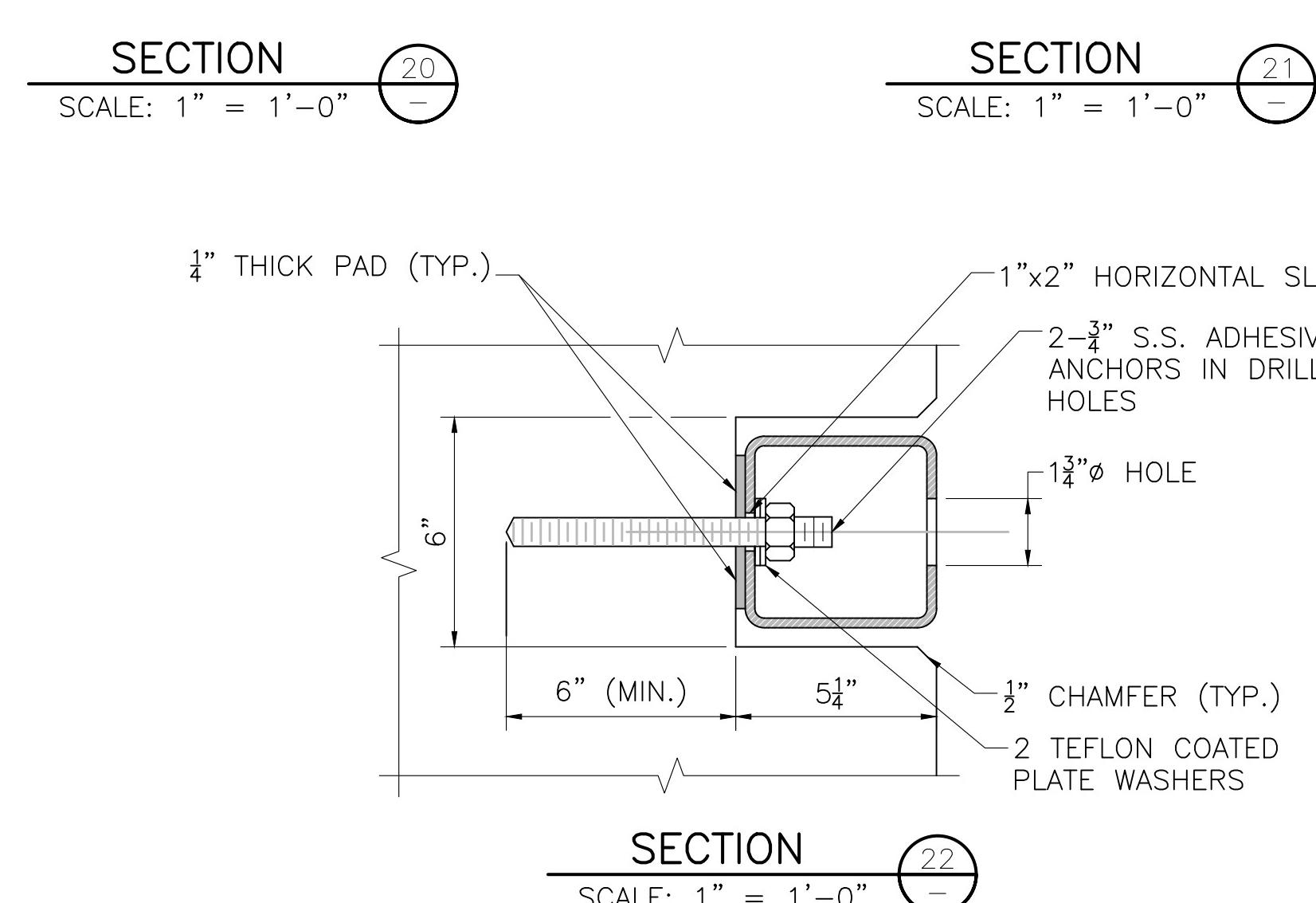
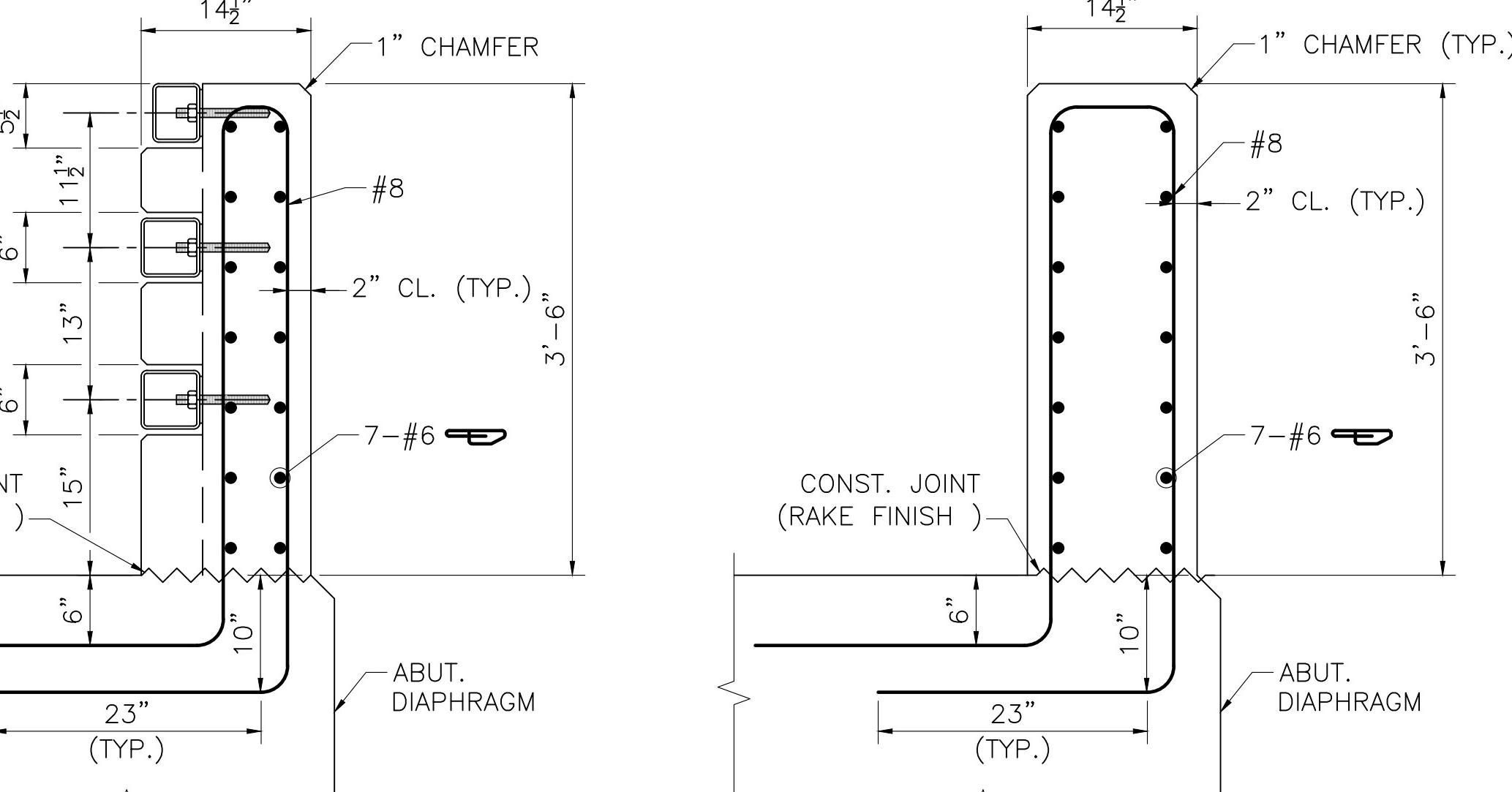
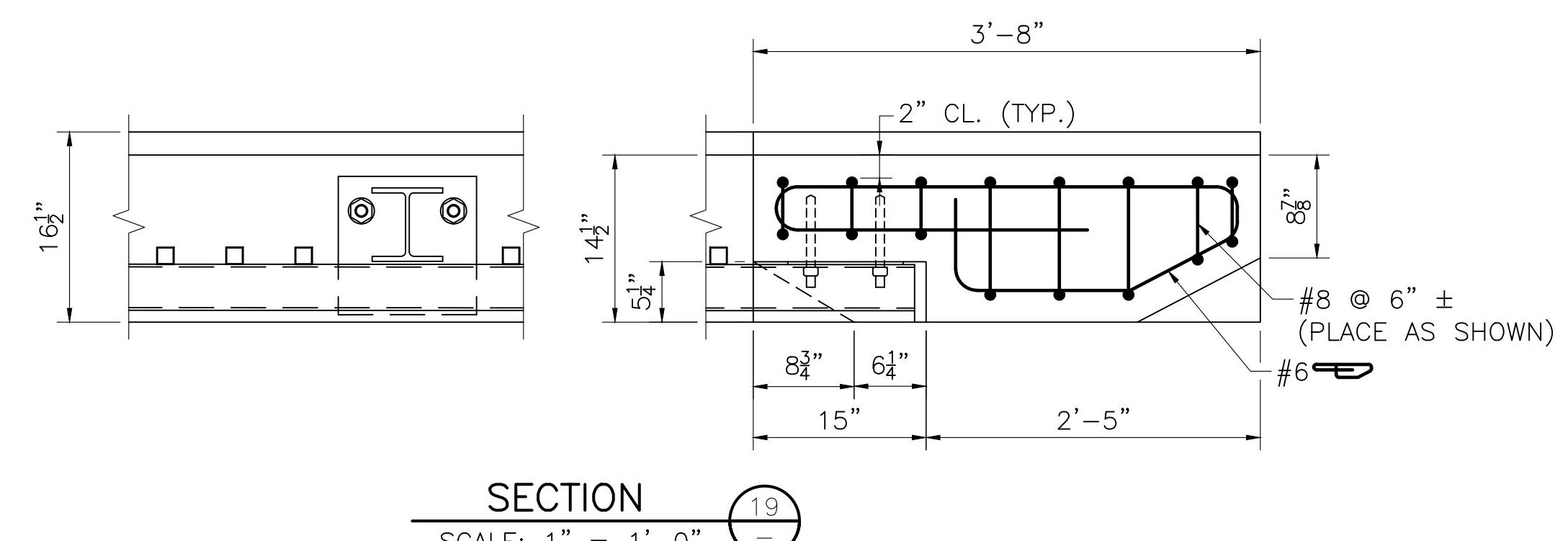
DECK DETAILS

SHEET 16 OF
25





RAIL ATTACHMENT
SCALE: 1 1/2" = 1'-0"



END POST NOTES:

- FOR AN APPROACH GRADE UP TO 3%, THE TRANSITION MAY BE CAST SQUARE AND SET PLUMB WITH THE MINIMUM EMBEDMENT DEPTH SHOWN.
FOR AN APPROACH GRADE IN EXCESS OF 3%, THE TRANSITION TOP AND THE TOP OF CURB SHALL FOLLOW THE APPROACH GRADE. THE HEIGHT OF THE TRANSITION TOP SHALL VARY PROVIDED THAT THE MINIMUM DIMENSIONS SHOWN ON THE CONSTRUCTION DRAWINGS ARE MET. THE BOTTOM OF THE TRANSITION BASE SHALL BE SET LEVEL WITH THE MINIMUM EMBEDMENT DEPTH SHOWN.
- USE LATEST CONTRACT COMPLETION YEAR IN EFFECT WHEN THE FIRST GUARDRAIL TRANSITION IS CAST. USE THIS YEAR FOR ALL GUARDRAIL TRANSITIONS.
- ALL CONCRETE FOR THE END POST SHALL BE 5000 PSI, 3/4", 685 HP CEMENT CONCRETE.

BRIDGE REPLACEMENT
TOWN OF ARLINGTON

PROPOSED BRIDGE REPLACEMENT
A-10-015 (C10)
US3 (MYSTIC STREET) OVER MILL BROOK

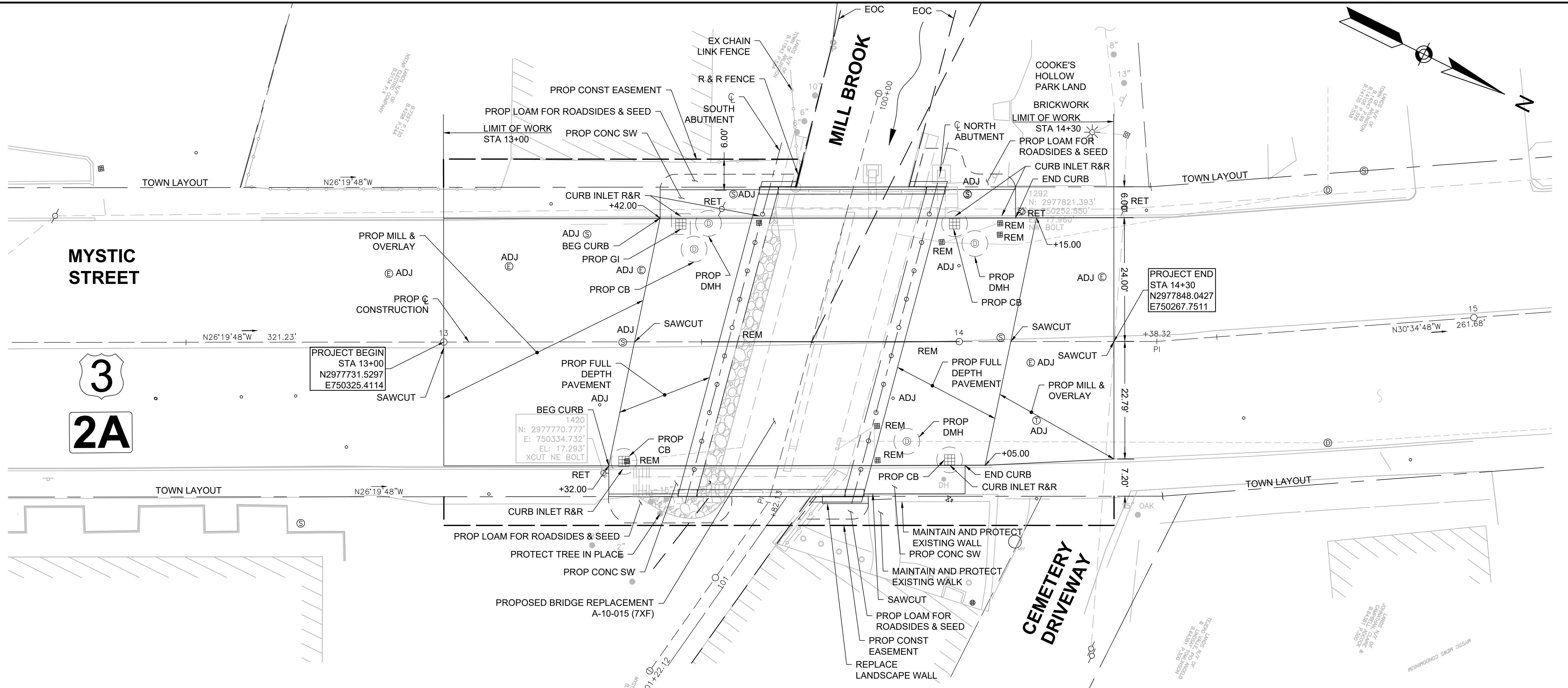
END POST DETAILS

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BRIDGE REPLACEMENT
TOWN OF ARLINGTON
PROPOSED BRIDGE REPLACEMENT
A-10-015 (C10)
US3 (MYSTIC STREET) OVER MILL BROOK

ROADWAY
PLAN &
TYPICAL
SECTION

SHEET 19 OF
25



PAVEMENT NOTES:

PROPOSED FULL DEPTH PAVEMENT

SURFACE COURSE: 1.5" - SUPERPAVE SURFACE COURSE - 9.5 (SSC - 9.5)
INTERMEDIATE COURSE: 2.5" - SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC - 19.0)
BASE COURSE: 4.5" - SUPERPAVE BASE COURSE - 37.5 (SBC - 37.5)

SUB BASE COURSE: 4" - DENSE GRADED CRUSHED STONE FOR SUB-BASE
8" - GRAVEL BORROW, TYPE B

TACKCOAT: 0.07 GAL PER SY

PROPOSED MILL & OVERLAY:

MILLING: PAVEMENT STANDARD MILLING, 1.5"
(VARIABLE DEPTH FOR RE-PROFILING BRIDGE APPROACH)

SURFACE COURSE: 1.5" - SUPERPAVE SURFACE COURSE - 9.5 (SSC - 9.5)
TACKCOAT: 0.08 GAL PER SY

PROPOSED CONCRETE WALK

SURFACE: 4" CEMENT CONCRETE SIDEWALK

FOUNDATION: 8" GRAVEL BORROW - TYPE B

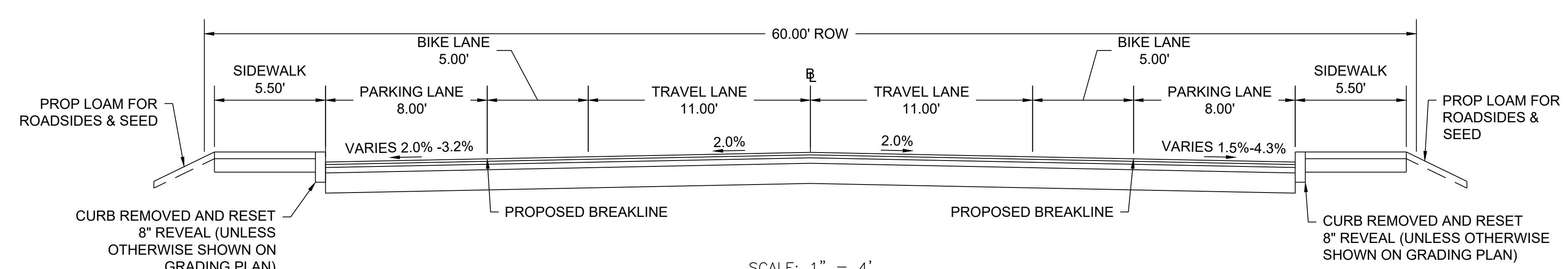
PAVEMENT MARKINGS:

ALL PAVEMENT MARKINGS SHALL BE REPLACED TO MATCH EXISTING CONDITIONS. SEE "MYSTIC STREET STRIPING PLAN", DATED NOV. 2016 FOR PAVEMENT MARKING LAYOUT, LEGENDS/SYMBOLS AND LIMITS.

UTILITY NOTES:

SEE UTILITY PLAN FOR ALL OTHER UTILITIES INCLUDING SANITARY SEWER.

NOTE: ABANDONED RAIL/TROLLEY TRACKS ARE EXPECTED TO BE PRESENT WITHIN THE PROJECT LIMITS BELOW THE SURFACE. ALL COSTS ASSOCIATED WITH REMOVAL, DISPOSAL, OR WORKING AROUND SHALL BE INCLUSIVE TO THE PAY ITEMS IN THE CONTRACT. THERE WILL BE NO SEPARATE PAYMENT DUE TO EXISTING RAIL/TROLLEY TRACKS.



	DRW BY	CALC BY	APPRV BY	DESCRIPTION
07/07/2022	ABL	ABL	SRC	ISSUED FOR CONSTRUCTION

63 KENDRICK STREET
NEEDHAM, MA 02494
781-355-7100 (FAX)

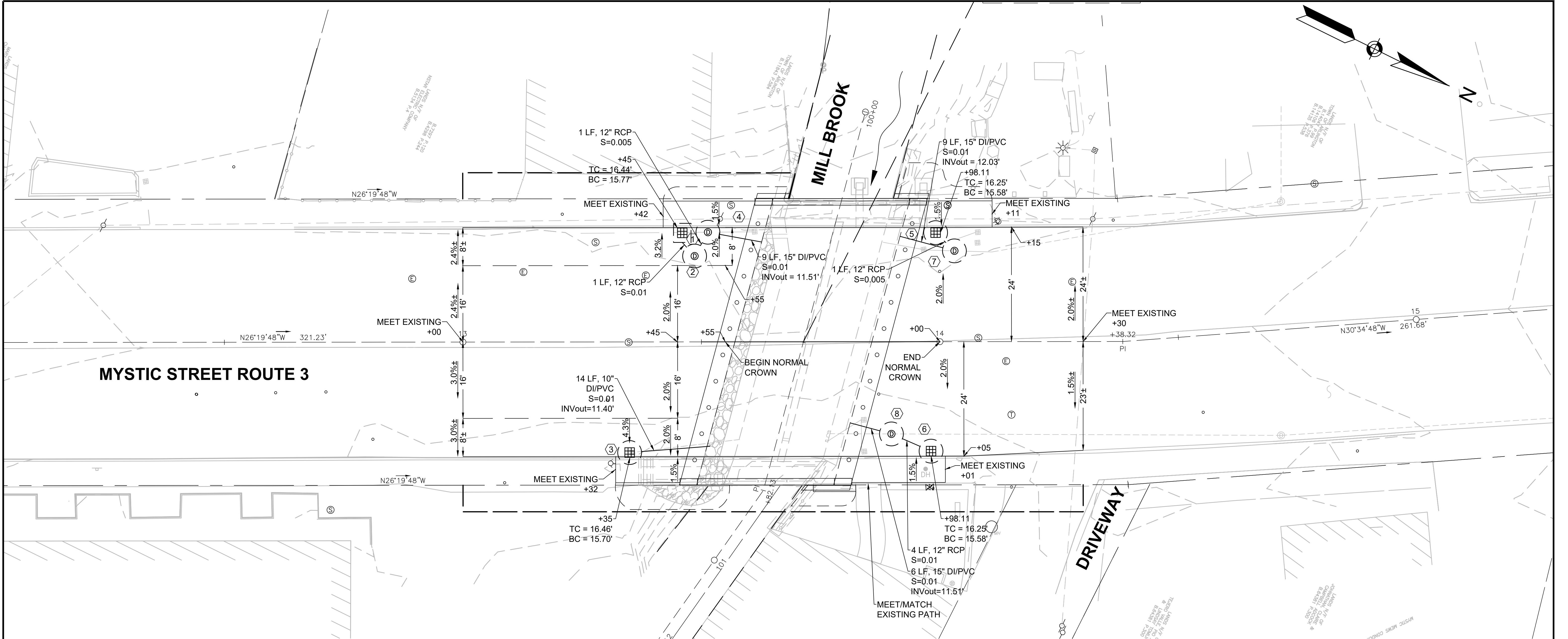
GILL
ENGINEERING

DATE

REGISTERED PROFESSIONAL ENGINEER

DATE

MYSTIC STREET ROUTE 3



SCALE: 1" = 10'

DRAINAGE STRUCTURE DATA

NO.	TYPE	STATION/OFFSET	RIM ELEVATION	INVERT ELEV. IN	INVERT ELEV. OUT	REMARKS
1	GCI	+45, LT	15.77'	-	13.27'	
2	CBCI	+45, 18' LT	16.03'	(1) 13.26'	12.53'	FRAME AND COVER
3	CBCI	+35, RT	15.70'	-	11.54'	
4	DMH	+55, 23' LT	15.83'	(EX. DMH) 13.20' (2) 12.52'	11.60'	
5	CBCI	+98.11, LT	15.58'	-	12.12'	
6	CBCI	+98.11, RT	15.58'	-	12.12'	
7	DMH	+02, 19' LT	15.70'	(EX. DMH) 12.11' (5) 12.11'	12.07'	
8	DMH	+18, 19' RT	15.71'	(EX DMH) UNKNOWN/TBD (6) 12.06'	11.57'	

BRIDGE REPLACEMENT TOWN OF ARLINGTON

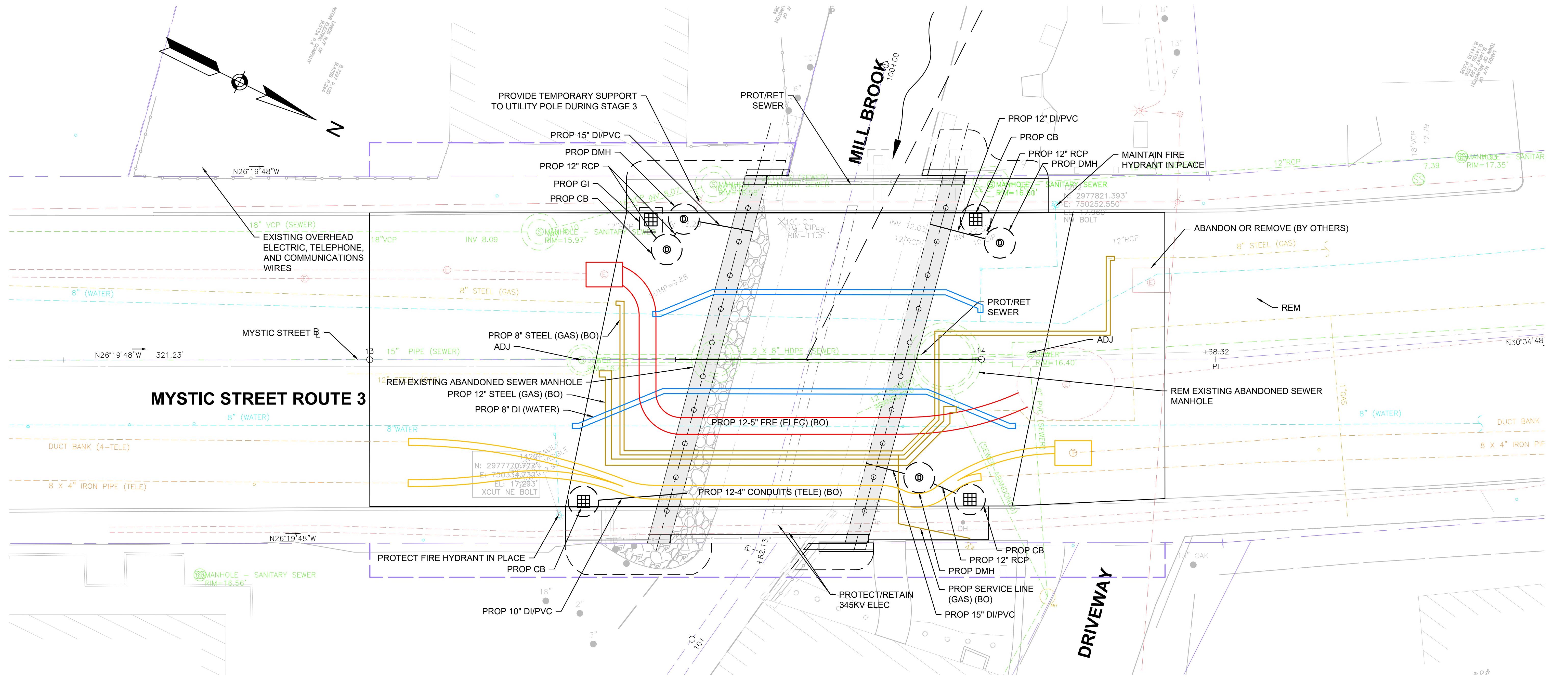
PROPOSED BRIDGE REPLACEMENT
A-10-015 (C10)
US3 (MYSTIC STREET) OVER MILL BROOK

CURBTIE,
GRADING &
DRAINAGE
PLAN

SHEET 20 OF
25

The logo consists of the word "GILL" in a large, bold, black sans-serif font, with a thick black diagonal line running through the letters. To the right of the line, the word "ENGINEERING" is written vertically in a smaller, black, all-caps sans-serif font.

**63 KENDRICK STREET
NEEDHAM, MA 02494
781-355-7100
781-355-7101 (FAX)**



BRIDGE REPLACEMENT

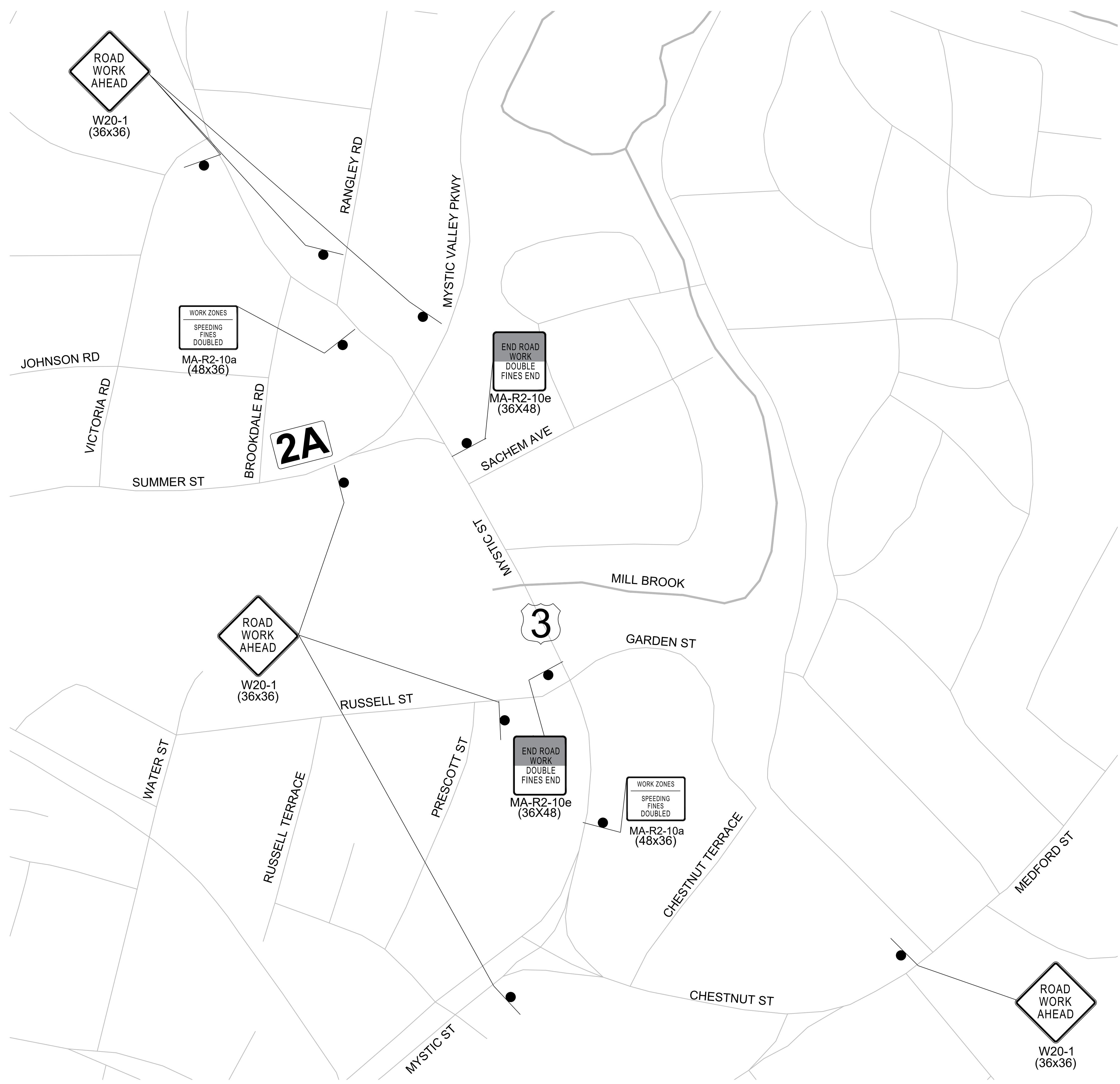
TOWN OF ARLINGTON

PROPOSED BRIDGE REPLACEMENT

A-10-015 (C10)
USS3 (MYSTIC STREET) OVER MILL BROOK

PROPOSED UTILITY PLAN

SHEET 23 OF
25



ADVANCE SIGNING PLAN

NOTES:

1. ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS, UNLESS SUPERCEDED BY THESE PLANS.
2. ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
3. TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
4. TEMPORARY CONSTRUCTION SIGNING, BARRICADES, AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
5. SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, CHANNELIZING DEVICES, BARRIERS, AND CRASH ATTENUATORS MUST PASS THE CRITERIA SET FORTH IN NCHRP REPORT 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES" AND/OR "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH).
6. CONTRACTORS SHALL NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT, AND SIMILAR OPERATIONS.
7. THE FIRST FIVE PLASTIC DRUMS OF A TAPER SHALL BE MOUNTED WITH TYPE A LIGHTS.
8. THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
9. DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
10. MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
11. MINIMUM LANE WIDTH IS TO BE 11 FEET (3.3m) UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
12. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.

LEGEND:

- DRUM OR CONE @ 15' O.C. (TYP)
- DIRECTION OF TRAFFIC
- SIGN
- ▨ TYPE III BARRICADE

63 KENDRICK STREET
NEEDHAM, MA 02494
781-355-7100
781-355-7101 (FAX)

GILL
ENGINEERING

DATE	DRAW. BY	CALC. BY	APPRV. BY	DESCRIPTION
07/07/2022	PFO	PFO	SRC	ISSUED FOR CONSTRUCTION

DATE

REGISTERED PROFESSIONAL ENGINEER

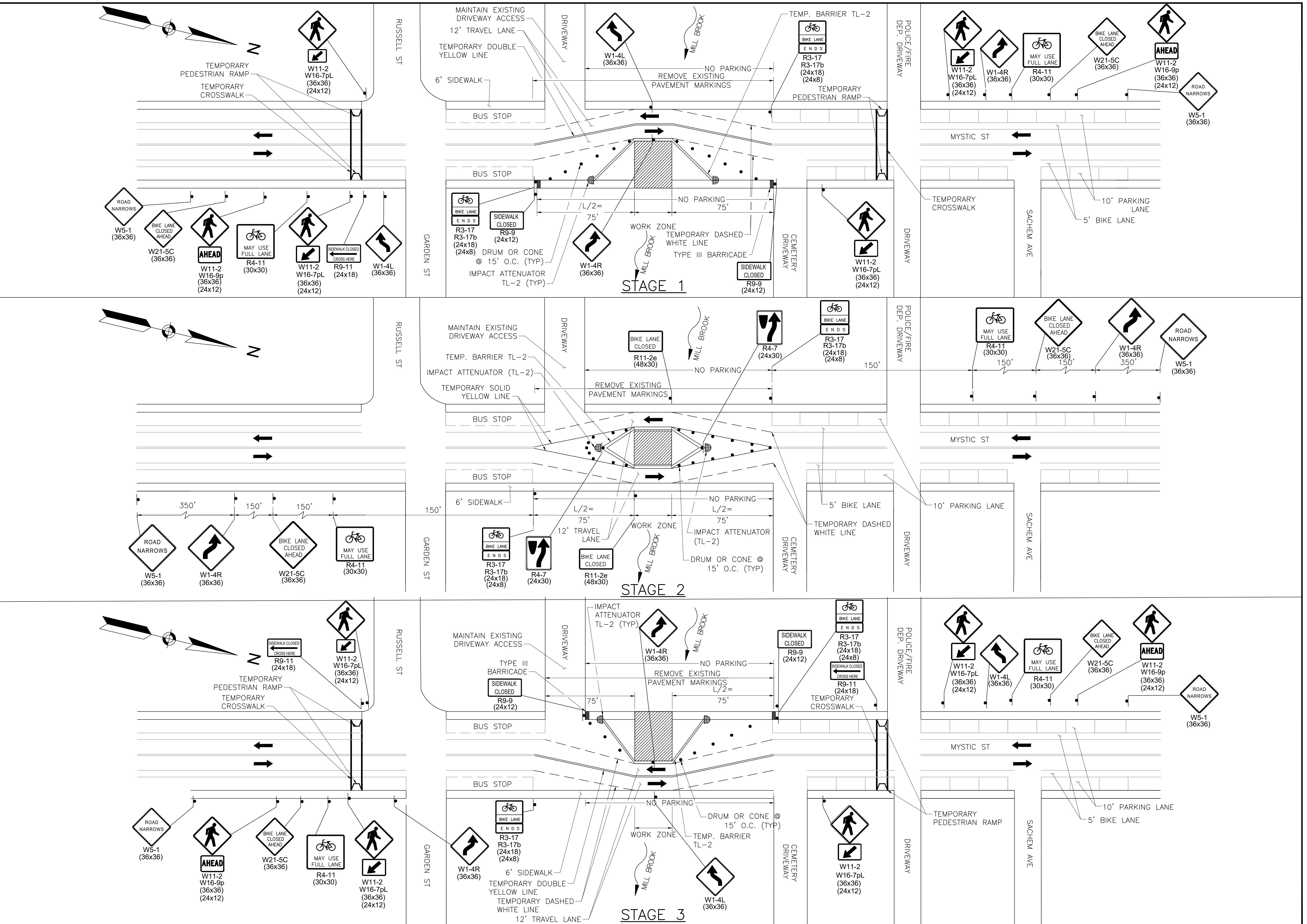
BRIDGE REPLACEMENT
TOWN OF ARLINGTON
PROPOSED BRIDGE REPLACEMENT
A-10-015 (C10)
US3 (MYSTIC STREET) OVER MILL BROOK

ADVANCE
WARNING
SIGN PLAN

SHEET 24 OF
25

DATE

REGISTERED PROFESSIONAL ENGINEER



APPENDIX B: Geotechnical Report

GEOTECHNICAL REPORT

A-10-015 (7XF) Bridge Replacement
Mystic Street (US 3) over Mill Brook, Arlington, MA
December 2017

Prepared for:

TOWN OF ARLINGTON



Gill Engineering Associates, Inc.
63 Kendrick Street
Needham, MA 02494

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- 5.2. Boring Logs
- 5.3. 1958 As-Built Widening Plans
- 5.4. Preliminary Design Calculations

1. INTRODUCTION

1.1. Scope of Report

The purpose of this report is to provide recommendations for the foundations for the replacement of bridge A-10-015 (7XF) in Arlington, Massachusetts. The replacement is necessary due to the exiting bridge poor overall condition. This report will evaluate the data from the subsurface exploration program along with data from previous explorations and provide the necessary parameters for designing proposed foundations. All parameters provided will be in accordance with AASHTO LRFD 7th Edition Design Specifications and the 2013 LRFD MassDOT Bridge Manual. The report will also provide recommendations for the construction of proposed foundations with guidance on minimizing potential construction issues.

1.2. Existing Structure and Site History

Bridge No. A-10-015 (7XF) is located on Mystic Street (US 3) and spans over Water Mill Brook as illustrated in Appendix 5.1 - Project Locus Map. The existing bridge is a 2-span structure, originally constructed in 1850 using granite slabs supported on masonry walls. It was later widened in each direction in 1958 with a reinforced concrete slab supported on reinforced concrete bents and concrete gravity abutments. Portions of the original granite slab have been replaced with steel stringers sometime after the 1958 widening. The width of the existing structure consists of a 48-ft roadway and (2) 6-ft wide sidewalks. The length of the original 1850 structure is 21-ft while the lengths on the 1958 widened structure were extended out to 32.33-ft and 35.58-ft, on the west and east sides, respectively.

1.3. Site Description

The bridge is oriented north-to-south with a single travel lane in each direction and a lane designated for parking on each side. Mystic Street is classified as an Urban Arterial and has an ADT of roughly 26,000 as of 2017. The bridge is bounded by buildings at the southwest and northeast quadrant while the other two quadrants consist of open space.

Mill Brook flows from west to east at the bridge location. The stream channel has an area of aggregation which consists of cobble stones at the upstream location near the southwest corner of the bridge. This material may have been the result of erosion of the adjacent embankment.

The site has many utilities located within the roadway corridor and within the bridge crossing which include:

- 1-8" gas line below at west sidewalk below concrete slab (exposed)
- 2-10" MWRA Sanitary Sewer line at west sidewalk location below streambed
- 4-3.5" electric lines located within the roadway and above granite slabs

- 1-8" gas line within roadway and below granite slabs (exposed)
- 1-12" steel gas line within roadway and above granite slabs
- 8-3.5" electric lines located within the roadway and above granite slabs
- 2-8" water lines within roadway and below streambed
- 2-8" cast iron sewer lines within roadway and below streambed
- 1-8" gas line within roadway and below granite slabs (exposed)
- 1-6" steel unknown line and below granite slabs
- 4-4" steel telecom lines within roadway and above granite slabs
- 8-4" steel telecom lines within roadway and above granite slabs
- 2-12" electrical high-voltage black lines below east sidewalk below concrete slab
- 3-6" VCP drainage pipes through north abutment
- 1-12" RCP drainage pipe through north abutment
- 3-10" CIP drainage pipe through south abutment
- Overhead lines along west edge

See Proposed Preliminary Structure Plans for a location layout of the existing utilities along with proposed relocation.

2. SUBSURFACE CONDITIONS

2.1. Local Geology

According to the Natural Resources Conservation Service mapping, the site is underlain by fine to gravelly sandy loam to a depth of 65 inches. The underlay of rock may include Diorite & Gabbro, Dedham Granite, and Cambridge Argillite according to the Massachusetts Geologic Map data.

2.2. Subsurface Exploration Program

The extent of the subsurface exploration program consisted of two (2) soil borings located off the roadway in the southeast and northeast quadrant (designated as B-1 and B-2). The borings were drilled using a 4 inch casing and a 2-3/8 inch split spoon sampler over the course of three (3) business days between August 28th and August 30th, 2017 by Geologic-Earth Exploration, Inc. of Norfolk, Massachusetts, and observed by Gill Engineering Associates, Inc. (GEA). The observation included a visual and hands on examination of the soil samples. See Preliminary Structure Plans for as-drilled boring locations and Appendix 5.3 for boring logs. GEA concurs with the information presented in the boring logs.

2.3. As-built Borings

The 1958 widening plans provide boring data at each corner of the widening. See Appendix 5.3. The borings describe the layers as course sand and gravel with boulders found in the upper 20-ft.

2.4. Subsurface Profile

2.4.1. South Abutment

The existing ground grade at BB-1 is at 15.0 which is 1.4 feet below road grade. The subsurface conditions typically consist of loose to medium dense granular soil consisting of a mixture of sand and gravel.

2.4.1.1. Top Layer

The top layer of soil is typically composed of loose fine to medium sand and gravel with a SPT value of 4 blows per foot (bpf). This layer appears to extend from existing grade down to a depth of 7-ft.

2.4.1.2. Upper Layer

Layers from 7-ft to the end of boring depth of 61-ft consists mostly of layers of medium dense gravel and layers of medium dense sand with a SPT value of ranging from 10 to 28.

2.4.1.3. Groundwater

Groundwater was not measured; therefore, it is assumed to be at the measured stream elevation of 9.0.

2.4.2. North Abutment

The existing ground grade at BB-2 is at 16.0 which is at .5 feet below road grade. The subsurface conditions typically consist of loose to medium dense granular soil consisting of a mixture of sand and gravel.

2.4.2.1. Upper Layer

The top layer of soil consists of stiff silt and fine sand over loose fine to course sand with SPT values from 4 to 9 blows per foot (bpf). This layer appears to extend from existing grade down to a depth of 7 feet.

2.4.2.2. Lower Layers

Layers from 7-ft to the end of boring depth of 58-ft consists mostly of layers of medium dense gravel and layers of medium dense sand with a SPT value of ranging from 13 to 29.

2.4.2.3. Groundwater

Groundwater was not measured; therefore, it is assumed to be at the measured stream elevation 9.0.

2.4.3. Soil Parameters

See Table 1 for recommended soil parameters for design.

Table 1: Recommended Soil Parameters

Layer	Unit Weight γ (lb/ft ³)	Friction Angle Φ
Upper (0' to 6')	115	32
Lower (>6')	120	34
Gravel Borrow	125	37

1. Friction angle based upon SPT N1₆₀ Correlation and AASHTO Table 10.4.6.2.4-1

2. Gravel borrow per MassDOT M1.03.0

2.5. Seismic Design Category Evaluation

Seismic design parameters were determined using the AASHTO Guide Specifications for LRFD Seismic Bridge Design, 2nd Edition 2011 with Interims thru 2015, and the 2013 MassDOT Bridge Manual. Calculations are presented in Appendix 5.4 – Preliminary Design Calculations. The following are recommended seismic parameters for design:

Site Class (AASHTO Table 3.4.2.1-1): D (Medium dense soil with 15< N <50 blows/ft)

Mapped Ground and Spectral Response (AASHTO LRFD Seismic Bridge Design):

2% Probability of Exceedance in 50 Years (2,500 year event) since the bridge is considered a critical/essential bridge being on a NHS route:

- Peak Horizontal Ground Acceleration (PGA): 0.15
- Horizontal Response Spectral Acceleration, 0.2 Sec (S_s): 0.25
- Horizontal Response Spectral Acceleration, 1.0 Sec (S₁): 0.075

Site Factors (AASHTO LRFD Seismic Bridge Design, Table 3.4.2.3-1, Table 3.4.2.3-2):

- Zero-Period (F_{pga}): 1.6
- Short Period (F_a): 1.6
- Long Period (F_v): 2.4

Design Spectral Response Parameters for Site Class D:

- A_s: 0.24 G
- S_{DS}: 0.40 G

- S_{D1} : 0.18 G

Seismic Design Category (AASHTO LRFD Seismic Bridge Design, Table 3.5-1)

- SDC: B

2.6. Liquefaction Potential

Based on the soil conditions found at the bridge site, seismically induced settlement should not be significant and therefore there is a low potential for liquefaction in the event of seismic activity. The soils present are medium dense and well graded. Additionally, the site has a low probability of having an event that would trigger liquefaction ($M < 6.0$).

3. RECOMMENDED FOUNDATION SYSTEM

3.1. Foundation Constraints

The location has many constraints for construction of a foundation including the following:

- Utilities-As noted in Section 1.3, many utilities are present within the bridge crossing. As such, the construction of the foundation system should be able to minimize disruption to these utilities.
- Nearby Buildings-The site has adjacent buildings located at the southwest and northeast quadrant of the bridge. The foundation installation shall minimize damage to these structures.
- Scour-The foundation shall be scour resistant or countermeasure should be in place to accommodate future scour.
- Control of Water-Consideration should be made in order to minimize foundation depths due to the presence of high ground water.
- Temporary Structures- Construction of the bridge and its foundations will require it to build in two stages; therefore, requiring a temporary structure to retain the roadways. An attempt should be made to minimize limits of any temporary structures in order to minimize impacts to utilities and nearby buildings.
- Obstructions-The proposed foundation should be located outside of the limits of the existing structure in order to minimize obstructions created by the existing structure. Boulders were found in the 1958 widening plan borings.

3.2. Shallow Foundation

The granular soil does provide adequate bearing resistance to support a spread footing foundation. Any settlements from foundation loads could be accommodated during construction. However, the depth of the footing will need to be low enough to accommodate frost protection and be lower than the depth of scour if adequate scour countermeasures are not provided. Also, the depth of the

foundation may conflict with the MWRA sanitary sewer and the Town water lines and sewer that are presently located below the stream bed.

3.3. Deep Foundation

If a shallow foundation cannot meet the constraints then a deep foundation may be the preferred alternative. It is recommended that the deep foundation be drilled-in versus driven due to the near proximity of utilities and buildings. A deep foundation supported on a reinforced concrete pile cap will reduce the required excavation as the bottom of the cap will not need to be as deep as a spread footing.

A foundation supported on micropiles is recommended for this site since it can be installed with drilling in order to limit vibrations. Lower installation height requirements needed for equipment will also help minimize impacts to overhead utilities. Furthermore, piles can be easily relocated in the field to accommodate conflicts and obstructions.

Micropiles may be used to support an integral abutment type superstructure as described in Section 3.10 of the 2013 MassDOT LRFD Bridge Manual. This type of design will allow a single row piles as the superstructure will provide lateral support with its rigid connection to the abutment. Since piles will be non-standard, a more refined Finite Element Analysis Method will be required for the design as described Section 3.10.11.5. This method will require the use of either L-Pile or Group Pile to model the soil-structure interactions. Recommended values for this type of analysis are listed below in Table 2.

Table 2: Recommended Soil Parameters

Layer	Unit Weight γ (pcf)	Friction Angle Φ	Soil Modulus K (pci)
Upper (0' to 6')	115	32	20
Lower (>6')	120	34	90
Lower Submerged (>6')	57.6	34	60

A preliminary micropile design was performed per AASHTO LRFD Bridge Design 7th Edition to determine the required size and length of the piles to support 32'-4" single span steel W24x62 superstructure. Summary of the design is provided in Table 3. See Preliminary Structure Plans and Appendix 5.4 for calculations.

Table 3: Micropile Design Results

#Piles/Abut	9
Casing	9.625" Dia. (API N80 Pipe)
Reinforcement	#11 bar (75 ksi)
Grout	4 ksi (Method B)
Pile Length	30 feet
Grout Length	15 feet
Max Fact Load	82 Kips (Strength I)
Fact Structural Resistance	$\phi R = 0.80 \times 117 \text{ Kips} = 94 \text{ Kips}$
Fact Geotechnical Resistance	$\phi R = 0.55 \times 172 \text{ Kips} = 95 \text{ Kips}$

A settlement analysis was also performed on the pile group per AASHTO LRFD Bridge Design 7th Edition. Settlements will be less than 0.25-in and will occur during construction.

4. CONSTRUCTION CONSIDERATIONS

4.1. Water Table

Groundwater was not measured during the subsurface exploration due to the rotary wash method. Therefore, the water table was assumed to be at the stream channel elevation of 9.0. Fluctuations with this elevation are expected with the seasonal flows of the stream. A bottom of footing below this elevation will require dewatering during construction in order to maintain construction in the dry. Discharge of pumped water should be performed in accordance with all federal, state and local regulations which may require a discharge permit.

4.2. Excavation

As required by OSHA regulations, lateral support is required for any excavation depth greater than four feet and where 1.5:1 slope cannot be maintained. Items for temporary earth support should be included in the contract documents. The design of any temporary support of earth (SOE) is the responsibility of the Contractor and should be designed in accordance with MassDOT and AASHTO requirements.

Due to tight site constraints, temporary support of earth (SOE) will likely be required along construction staging lines and near existing buildings. As with the permanent foundation, it is recommended not to use a driven foundation such as steel sheet pile. A drilled-in soldier pile with timber lagging or a gravity type structure is recommended.

4.3. Obstructions

As previously discussed, it is recommended to locate the proposed foundation outside the footprint of the existing foundation to minimize obstructions. Since the bridge site is located within an urban setting other abandoned foundations and utilities, bricks or cobbles may be present within the subsurface of the site. The existing 1958 widening plans did note boulders in the upper 20 feet. Additionally, abandoned streetcar rails are known to exist below the southbound roadway surface.

4.4. Protection of Adjacent Structures and Utilities

As previously stated, the bridge carries multiple utilities. Care shall be taken to properly identify and relocate all utilities as necessary during construction to minimize impacts. Staging plans detailing the relocation of these utilities will be required.

Utilities that are sensitive to movement and vibrations should be monitored. Utility owners should be consulted to establish threshold limits for movement and vibrations.

It is recommended that a preconstruction survey be conducted on existing structures within 100 feet of proposed construction. The survey shall document all pre-existing cracks, settlements, displacements, spalling, damage or other pre-existing adverse effect of each structure using descriptions, video, photographs, measurements and survey techniques.

4.5. Sequence of Construction Activities

The replacement bridge is to be constructed using staged construction. It is anticipated that the construction staging will occur in two phases. Backfilling behind the abutment stems and wing walls should be performed in accordance with MassDOT Standard Specifications. It is important to follow procedures set forth in the specifications to avoid unbalanced loading effects for which the structure is not designed. Temporary excavation support should be in place before excavations for foundations or subgrades are made.

4.6. Micropile Installation

It is recommended to use temporary or permanent casing through the granular soils in order to maintain an open hole to allow proper placement of grout. Grouting should be performed through a tremie pipe under pressure in order to improve the grout to ground bond strength. Centralizers shall be used with the reinforcement to maintain grout cover.

Field testing shall include both a performance test on a verification pile and proof testing on one production pile per abutment. Testing shall be done per Procedure A-Quick Test of ASTM D1143, "Standard Test Method for Piles Under Static Axial Compressive Load" or per Procedure A – Quick Test of ASTM D3689-07. "Standard Test Methods for Deep Foundations Under Static Tensile Load".

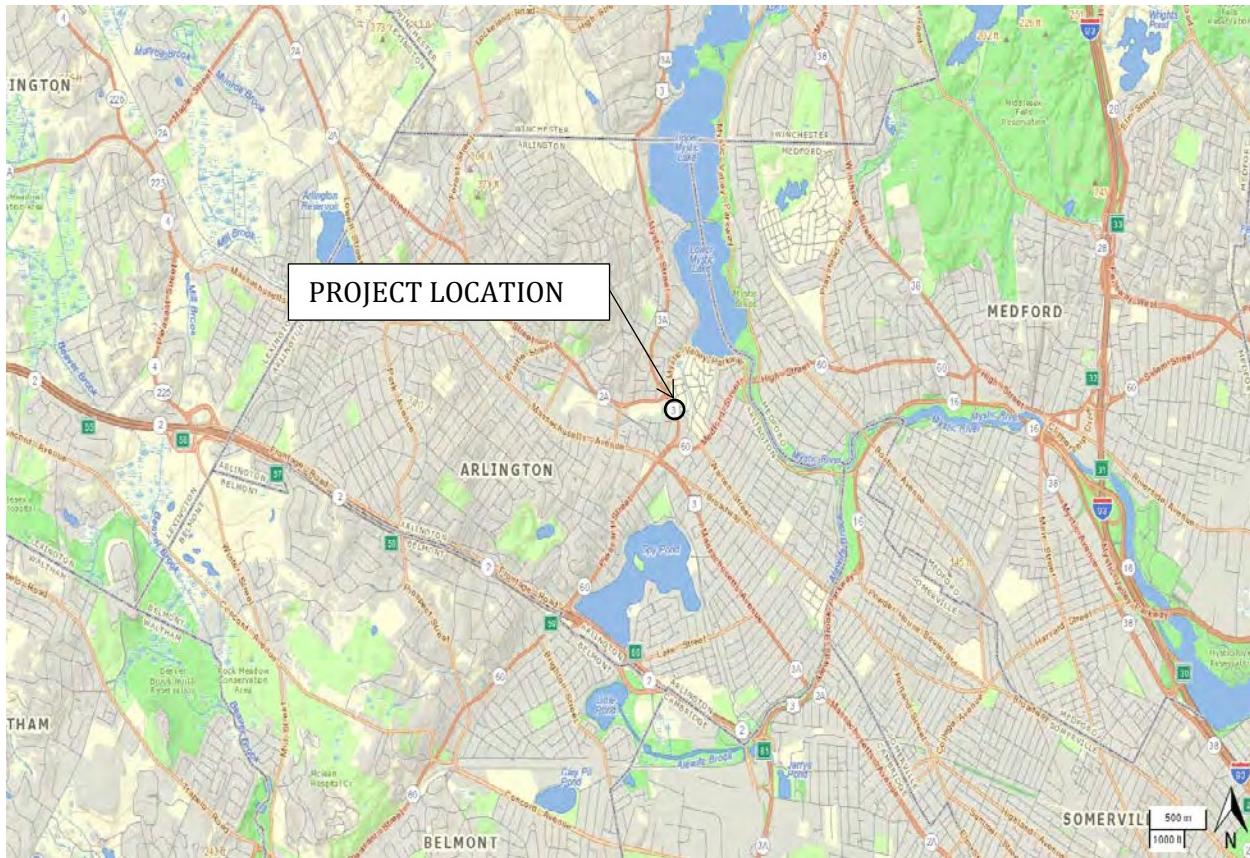
4.7. Special Construction Considerations

Special care should be taken to adhere to the guidelines and policies outlined out by the Massachusetts Department of Environmental Protection (MassDEP) in Policy # COMM-97-001 as well as the 310 CMR 40.0000: Massachusetts Contingency Plan. Excavated soil should be tested by an approved laboratory for contaminants at reporting thresholds outlined in 310 CMR 40.1600: Massachusetts Oil and Hazardous Materials List. If reportable compounds are present, excavated material must be transported and disposed of at a MassDEP approved location. Contaminated material that has been excavated will not be permitted to use as backfill. Testing and transportation of any contaminated soil shall be included as an item in the contract documents and shall be the responsibility of the Contractor.

APPENDIX

5.1. Project Locus Map

APPENDIX



APPENDIX

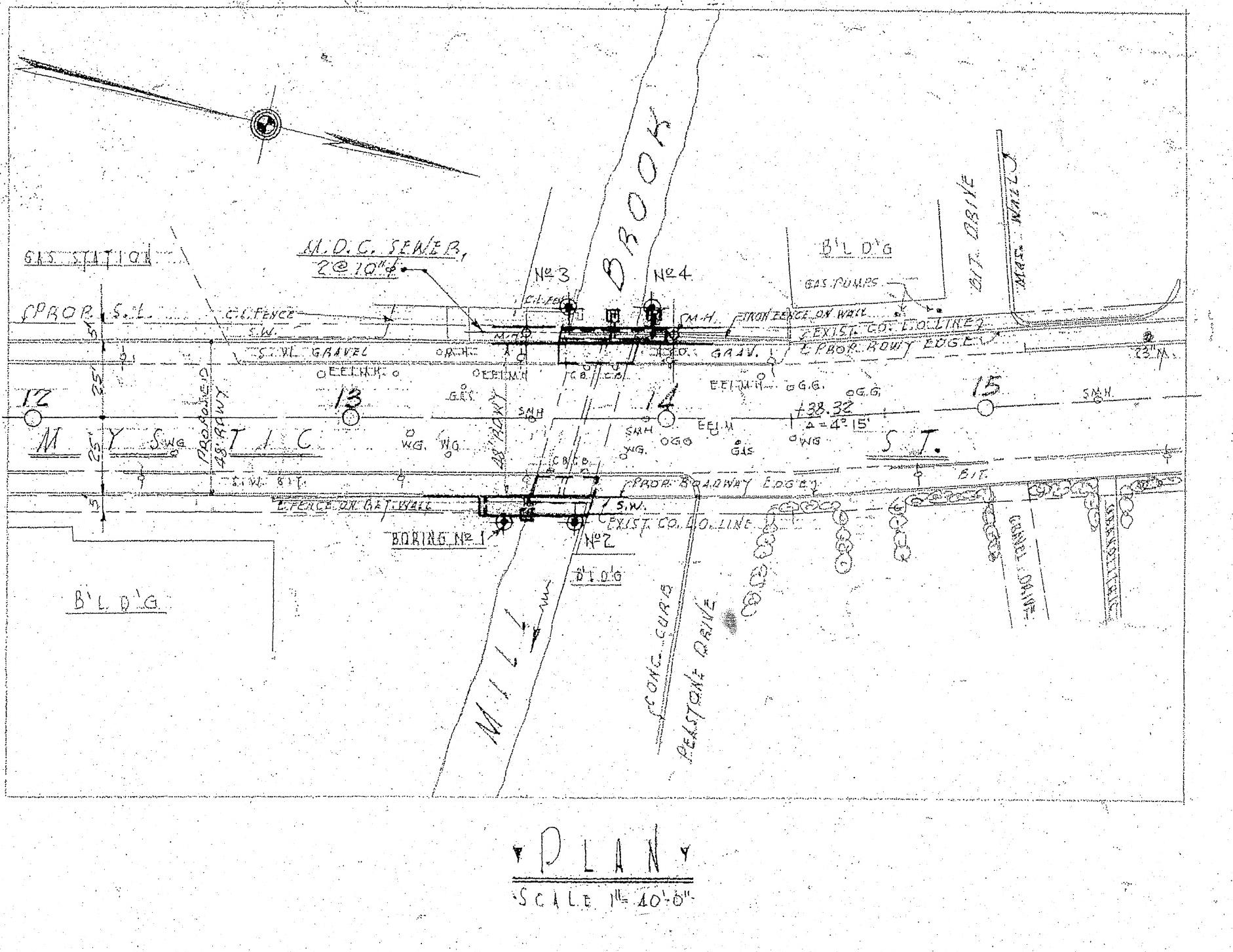
5.2. Boring Logs

Geologic - Earth Exploration, Inc.					CLIENT: Gill Engineering, Inc.	BORING #:		
					PROJECT: 91 Mystic Street	B-1		
					LOCATION: Arlington, MA	PAGE		
						1 OF 1		
7 Sherwood Drive TEL 508 384 4434		Norfolk, MA 02056 FAX 508 384 4452		CASING TYPE SIZE HAMMER FALL	SAMPLER SS 2 3/8" 140# 30"	CORE BARREL --- --- --- ---	Surface Elevation: 15.0 Station: 10+43.60, 41.33' RT Groundwater level readings Date _____ Depth _____ Date _____ Depth _____	
Depth ft	Sample				Sample Description			
	No.	Depth ft	Pen. in	Rec. in				Blows/6"
	S-1	0.0-2.0	24	12	2-2-2-2	S-1 Dry loose brown fine to medium SAND and GRAVEL		
	S-2	4.0-6.0	24	6	2-2-2-2	S-2 Moist loose brown medium to coarse SAND and GRAVEL, some fine Sand		
10	S-3	9.0-11.0	24	1	18-12-10-10	S-3 Moist medium dense gray to brown fine to coarse GRAVEL		
	S-4	14.0-16.0	24	2	15-5-5-4	S-4 Moist medium dense dark gray fine to coarse GRAVEL, some Sand		
20	S-5	19.0-21.0	24	1	9-4-9-8	S-5 Moist medium dense gray fine to medium GRAVEL, trace Sand		
	S-6	24.0-26.0	24	12	11-10-6-4	S-6 Moist medium dense gray fine SAND, trace of Silt and Gravel		
30	S-7	29.0-31.0	24	6	16-16-12-11	S-7 Similar to S-6		
	S-8	34.0-36.0	24	6	14-10-9-10	S-8 Similar to S-6		
40	S-9	39.0-41.0	24	8	13-8-7-8	S-9 Moist medium dense gray fine SAND and GRAVEL, some fine to coarse Sand		
	S-10	44.0-46.0	24	6	11-13-6-9	S-10 Similar to S-9		
50	S-11	49.0-51.0	24	4	9-6-5-8	S-11 Moist medium dense fine to coarse SAND and GRAVEL, little fine Sand		
	S-12	54.0-56.0	24	8	7-14-10-13	S-12 Moist medium dense gray GRAVEL and fine to coarse SAND		
60	S-13	59.0-61.0	24	8	15-9-10-12	S-13 Moist medium dense gray fine to coarse SAND, little Gravel		
						Bottom of exploration at 61.0' -0'-41' DONUT HAMMER USED -41'-56' AUTOMATIC HAMMER USED		
Ground Surface to _____ used _____ then _____								
Proportions Used		Cohesive Consistency Blows/ft				Cohesionless Density Blows/ft		Sample Type
Trace	0 to 10%	0-2	Very Soft	9-15	Stiff	0-10	Loose	UP = Fixed Piston
Little	10 to 20%	3-4	Soft	16-30	V-Stiff	10-30	M-Dense	UT = Shelby Tube
Some	20 to 35%	5-8	M-Stiff	31+	Hard	30-50	Dense	OE = Open End Rod
And	35 to 50%					50+	V-Dense	* = 300# hammer
Notes:	1. The stratification lines represent the approximate boundary between soil types. The transition may be gradual. 2. Water level readings were made in the drill hole during or at the completion of drilling. The water level may fluctuate over time.							
Remarks:	NOTE: All soil descriptions are made in the field by the Drilling Foreman. No laboratory analyses were performed for this purpose.							

Geologic - Earth Exploration, Inc.					CLIENT: Gill Engineering, Inc.	BORING #:		
					PROJECT: 91 Mystic Street	B-2		
					LOCATION: Arlington, MA	PAGE		
						1 OF 1		
7 Sherwood Drive TEL 508 384 4434		Norfolk, MA 02056 FAX 508 384 4452		CASING TYPE HW	SAMPLER SS	CORE BARREL	Surface Elevation: 16.0	
Date Started: 8/29/17		SIZE 4"			Station: 11+40.50, 56.5' LT			
Date Completed: 8/30/17		HAMMER 300#	1 3/8"		Groundwater level readings			
Driller: K.Eastwood		FALL 30"	140#	---	Date _____	Depth N/O		
Site Rep.:			30"	---	Date _____	Depth _____		
Depth ft	Sample				Sample Description			
	No.	Depth ft	Pen. in	Rec. in				Blows/6"
	S-1	0.0-2.0	24	6	2-5-4-5	S-1 Moist stiff brown SILT and fine SAND, TOPSOIL and Roots		
	S-2	4.0-6.0	24	5	7-2-2-3	S-2 Moist loose dark brown fine to coarse SAND, some sandy Silt		
10	S-3	9.0-11.0	24	3	17-11-15-16	S-3 Moist medium dense gray fine to coarse GRAVEL, some silty Sand		
	S-4	14.0-16.0	24	5	8-9-6-13	S-4 Moist medium dense gray fine to coarse SAND and GRAVEL, trace gray Silt		
20	S-5	19.0-21.0	24	6	6-8-9-7	S-5 Moist medium dense gray fine to medium GRAVEL, little Sand		
	S-6	24.0-26.0	24	6	9-8-5-8	S-6 Moist medium dense gray fine to coarse GRAVEL, little gray Sand		
30	S-7	29.0-31.0	24	5	8-9-8-9	S-7 Similar to S-6		
	S-8	34.0-36.0	24	2	13-13-11-12	S-8 Similar to S-6		
40	S-9	39.0-41.0	24	5	14-16-13-15	S-9 Moist medium dense gray fine to coarse SAND and GRAVEL		
	S-10	44.0-46.0	24	8	11-12-11-14	S-10 Similar to S-9		
50	S-11	49.0-51.0	24	9	12-15-14-14	S-11 Moist medium dense brown SAND and GRAVEL, little Loam and fine Sand		
	S-12	54.0-56.0	24	10	21-23-22-17	S-12 Moist medium dense gray fine to coarse SAND and GRAVEL, trace gray Silt		
	S-13	56.0-58.0	24	12	10-9-9-8	No sample was recovered with the 2" split spoon. 3" split spoon used instead. Rock was found at the end of the sample		
60						S-13 Moist medium dense gray fine to coarse silty SAND, trace gray Silt		
						2" Split spoon extension used w/o drilling		
						Bottom of exploration at 58.0'		
						AUTOMATIC HAMMER USED		
Ground Surface to _____ used _____ then _____								
Proportions Used		Cohesive Consistency Blows/ft				Cohesionless Density Blows/ft		Sample Type
Trace	0 to 10%	0-2	Very Soft	9-15	Stiff	0-10	Loose	UP = Fixed Piston
Little	10 to 20%	3-4	Soft	16-30	V-Stiff	10-30	M-Dense	UT = Shelby Tube
Some	20 to 35%	5-8	M-Stiff	31+	Hard	30-50	Dense	OE = Open End Rod
And	35 to 50%					50+	V-Dense	* = 300# hammer
Notes:	1. The stratification lines represent the approximate boundary between soil types. The transition may be gradual. 2. Water level readings were made in the drill hole during or at the completion of drilling. The water level may fluctuate over time.							
Remarks:	NOTE: All soil descriptions are made in the field by the Drilling Foreman. No laboratory analyses were performed for this purpose.							

APPENDIX

5.3. 1958 As-Built Widening Plans



PLAN

SCALE 1:400

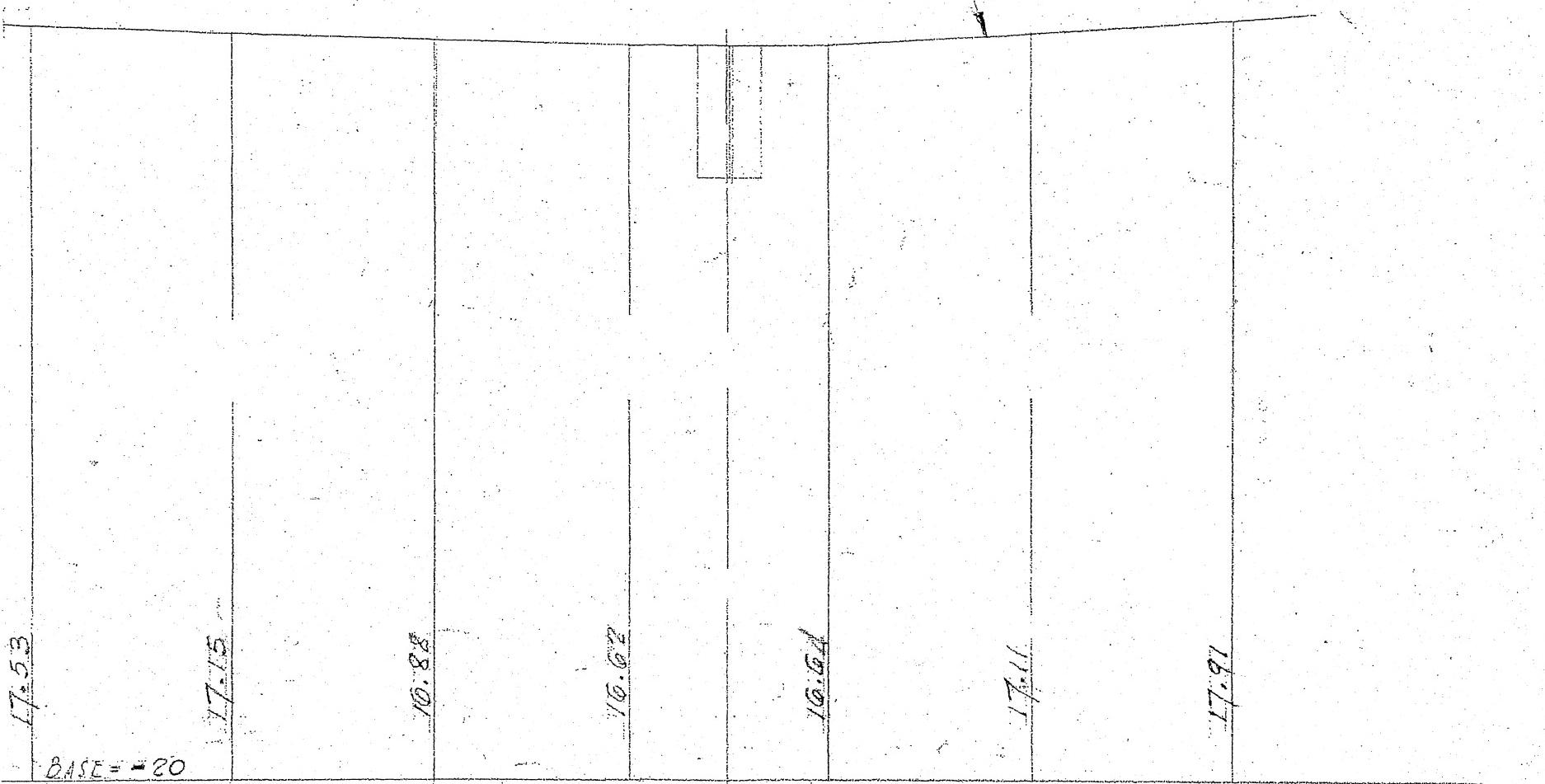
POSITIONS OF PROPOSED FOUNDATIONS

WATER LEVEL EL. 11.5		WATER LEVEL +12.02		WATER LEVEL +12.02	
	EL. 10.17 10.67		EL. 11.07 +2.5		+10
SE D, VEL LDERS	19 COARSE SAND, GRAVEL AND BOULDERS +0.1	18 COARSE SAND, GRAVEL AND BOULDERS +4.0	17 COARSE SAND, GRAVEL AND BOULDERS +2.5	COARSE SAND, GRAVEL AND BOULDERS 0.0	
SE Y D, VEL LDERS	15 COARSE YELLOW SAND, GRAVEL -7.5	13 SAND AND GRAVEL -7.5	12 COARSE SAND AND GRAVEL -6.0	COARSE YELLOW -10	
SE OW D VEL LDERS	-14.9	16 AND BOULDERS -13.5	14 AND GRAVEL -14.0	SAND AND GRAVEL -7.0	
SE OW D VEL LDERS	26 GRAVEL AND BOULDERS -28.9				
ACT SE OW D EL LDERS CT E YELLOW GRAVEL ERS	37 COMPACT SAND, GRAVEL AND BOULDERS -36.9				
ACT SE OW D EL LDERS CT E YELLOW GRAVEL ERS	57 VERY COMPACT COARSE SAND, GRAVEL AND BOULDERS -46.9				

No 2 No 3 No 4

TAKEN BY CARR CONSTRUCTION CORP. JAN. 1958.
SCALE 1" = 8'-0"

PROPOSED SURFACE TO BE 2" ABOVE EXISTING SURFACE



PROFILE OF MYSTIC STREET

HORIZONTAL SCALE 1" = 40'-0" VERTICAL SCALE 1" = 8'-0"

GENERAL NOTES.

FOUNDATIONS

CONSTRUCTION: MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED IN CONSTRUCTION.
ENCLOSURE:

STRUCTURE

ALL REINFORCING STEEL BARS SHALL CONFORM TO A.S.T.M. SPECIFICATION A-305. UNLESS OTHERWISE SHOWN ON THE PLANS, REINFORCING BARS SHALL BE LAPPED 20 DIAMETERS TO MAKE A SPLICE, EXCEPT THAT MAIN REINFORCING BARS NEAR THE TOP OF SLABS AND BEAMS HAVING MORE THAN 12 INCHES OF CONCRETE UNDER THE BARS SHALL BE LAPPED 35 DIAMETERS TO MAKE A SPLICE.

DRINKING NOTES:

LOCATIONS OF BORINGS SHOWN ON KEY PLAN. THUS: - • No. 3. BORINGS TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW NATURE OF MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION. FIGURES IN COLUMNS INDICATE BLOWS PER FOOT ON 1½ PIPE PRODUCED BY 30 INCH FALL OF 140 POUND HAMMER. BORING SAMPLES MAY BE SEEN AT THE DEPARTMENT'S LABORATORY IN THE MAINTENANCE BUILDING ON ROUTE NO. 9 IN WELLESLEY.

DESIGN:

IN ACCORDANCE WITH THE CURRENT SPECIFICATIONS OF THE
A.A.S.H.O. FOR H-20-44 LOADING.

ALTE

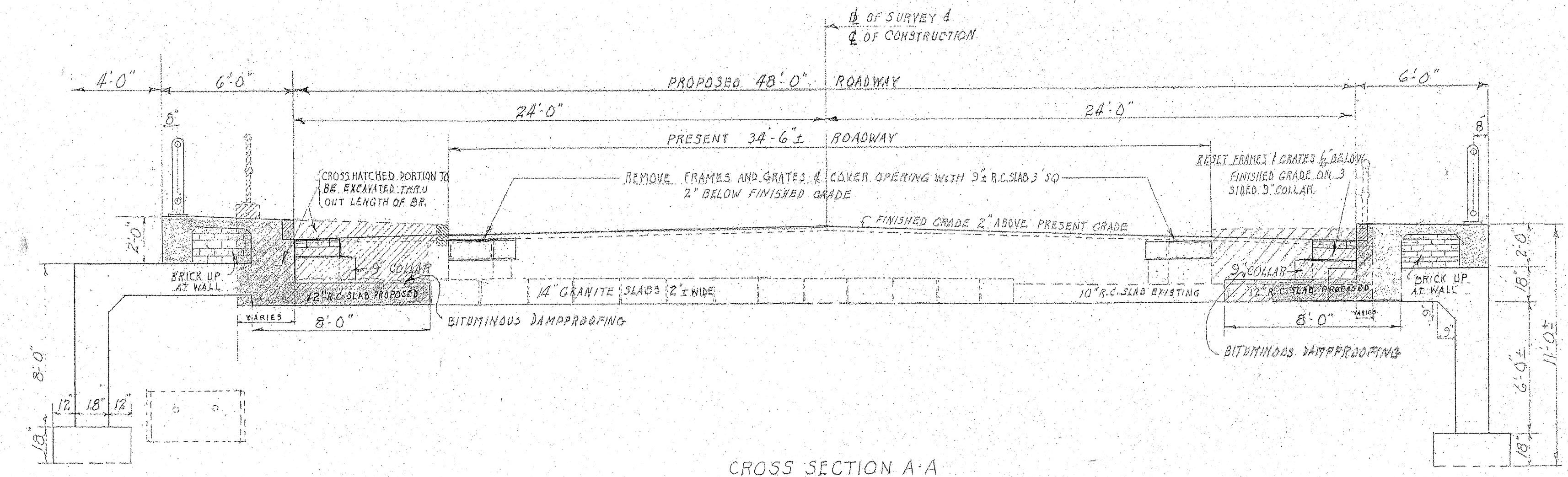
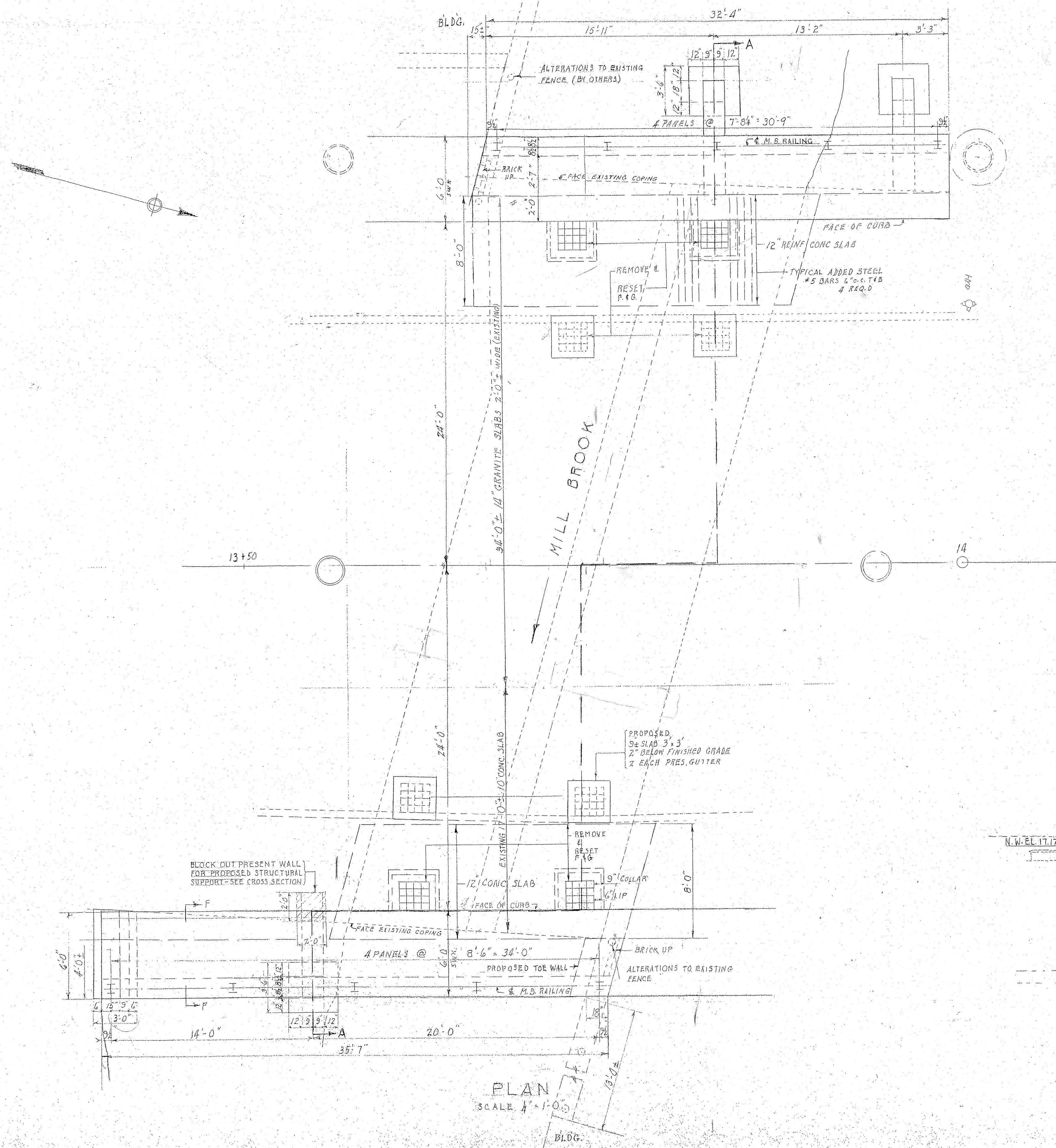
TO BE SPLICEO IN CENTRE OF OUTSIDE FACES
OF SIDEWALK BEAMS. FOR SITE AND
CHARACTERS OF NUMBERBALS, SEE ANOTHER SHEET.

ENCL MARKS: HYDRAULIC (b) STATION 10+59, EL 21.59

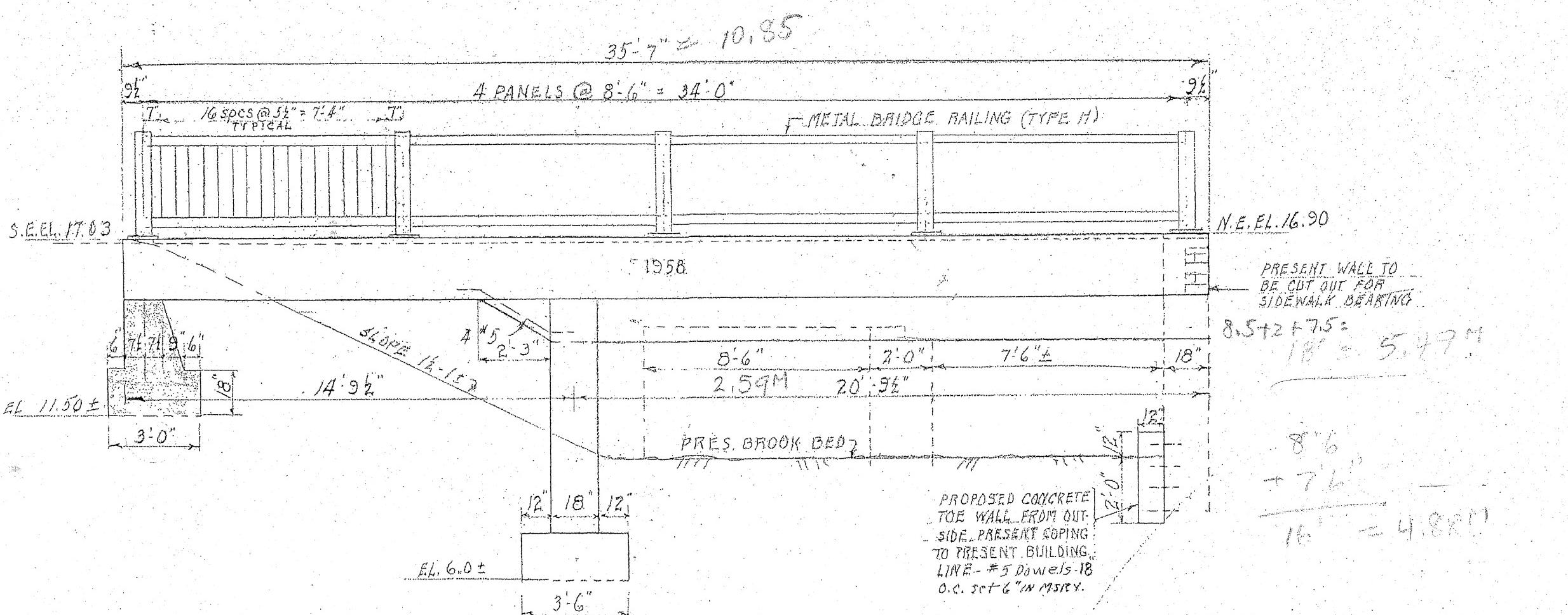
OF GILBERT FERD

BRIDGE EXCAVATION	84 CY.
ASS B BLOCK EXCAVATION	5 CY.
SOD B/T EXCAVATION	5 CY.
ASS I CEM. CONC. MASONRY	45 CY.
EEI BELIEF. FOR STRUCTURES	7,900 LBS.
MATERIAL FOR POINTING	2 BBLS
TUMULOUS DAMP - PROOFING	30 ST.
TAI BRIDGE BAILING - TYPE H	66 LF.
AMES & GRATES RENDELED & REST.	4 EA.
WHITE CURB, TYPE VAS, STB 6" x 11"	705 LF.
E BALIORS TO PIPE BALI FENCE	116

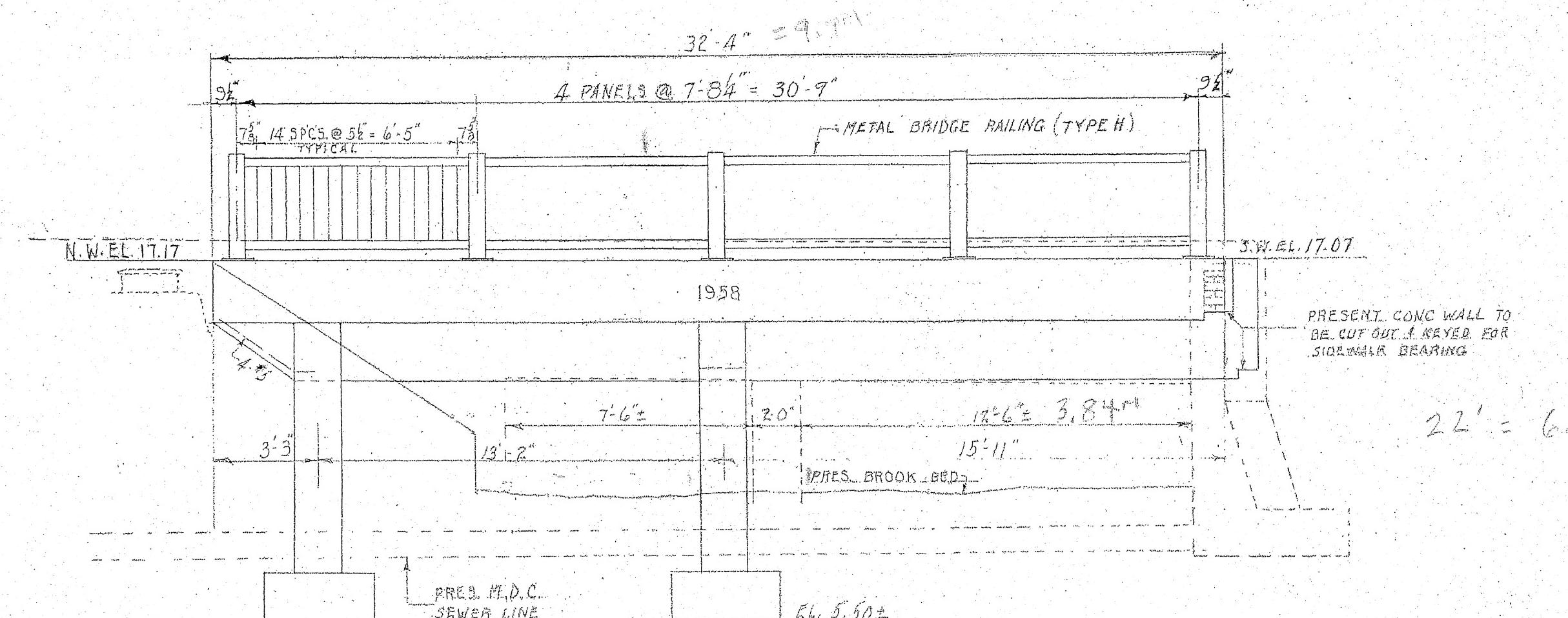
MAY 24, 1958 ISSUED FOR CONSTRUCTION
THE COMMONWEALTH OF MASSACHUSETTS
PROPOSED BRIDGE
EXTENSION
ARLINGTON
Mystic Street Station 13+72
Over Mill Brook
SCALES AS NOTED.
OFFICE OF
DEPARTMENT OF PUBLIC WORKS
100 Nashua St. BOSTON, MASS.
MAY 1958



POSS SECTION A-A
SCALE 1/4" = 1'-0"

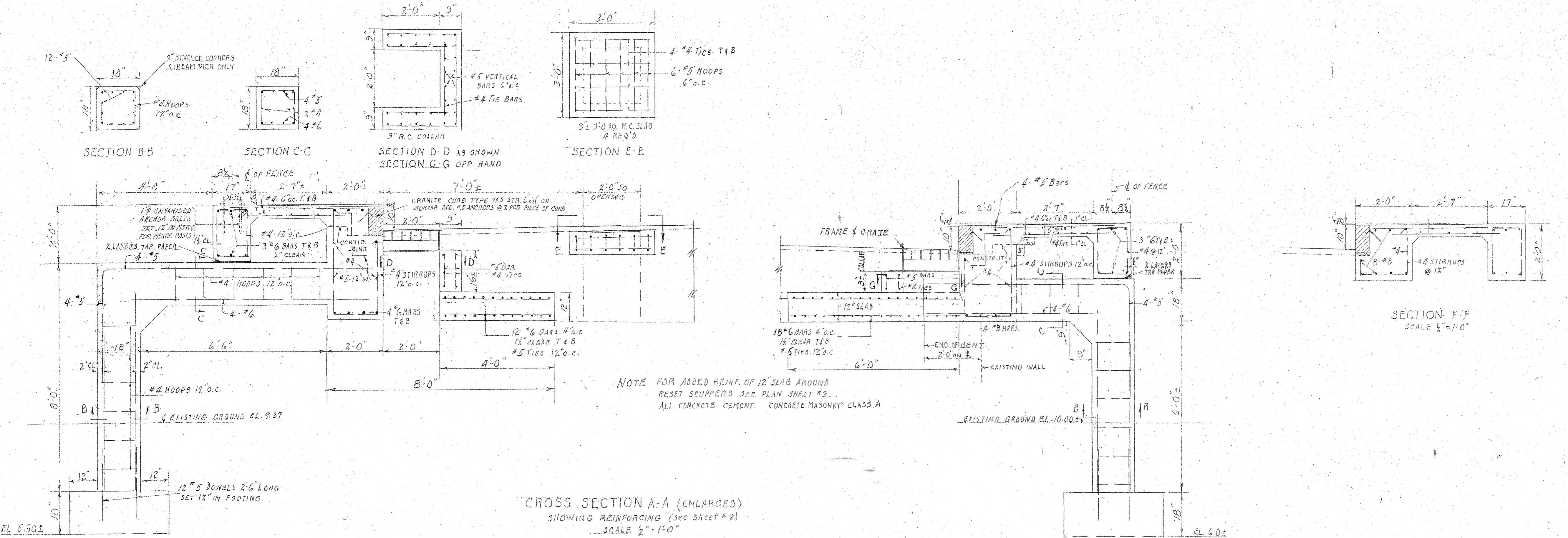


FASTERLY ELEVATION
SCALE $\frac{1}{4}$ " = 1'-0"

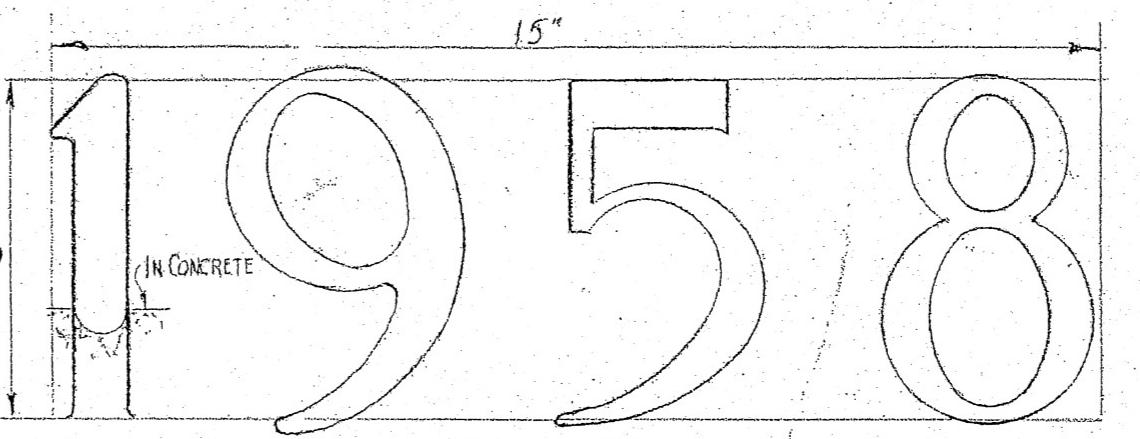


WESTERLY ELEVATION
SCALE $\frac{1}{4}'' = 1'-0''$

4,1958 ISSUED FOR CONSTRUCTION
TYPE DESCRIPTION
USE ONLY PRINTS OF LATEST DATE



CROSS SECTION A-A (ENLARGED)
SHOWING REINFORCING (see sheet #2)
SCALE 1/8"=1'-0"

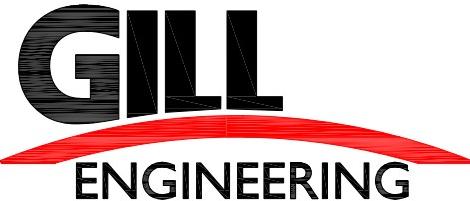


DETAIL OF BRIDGE DATE

MAY 24, 1958	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
	USE ONLY PRINTS OF LATEST DATE

APPENDIX

5.4. Preliminary Design Calculations



CLIENT TOWN OF ARLINGTON
PROJECT ARLINGTON
BRIDGE NO. A-10-015 (7XF)
SUBJECT _____

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DATE DEC. 2017

PROPOSED LOADS

A-10-015 (7XF)

References

- (1) AASHTO LRFD Bridge Design, 7th Edition, 2014 (thru 2016 interims)
(2) MASSDOT LRFD Bridge Design Guidelines

Proposed Dead Loads

Superstructure Dead loads

Bridge Length = 35.83 ft

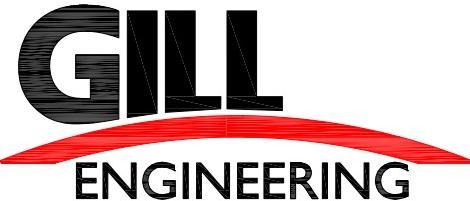
	Width (ft)	Thick. (ft)	Area (ft ²)	Length (ft)	Unit Weight (kcf/klf)	Quantity	Load (kips)
Beam (W24x62)	-	-	-	32.33	0.062	11	22.05
Diaphragm	-	-	-	35.83	0.025	10	8.96
Haunch	0.59	0.13	0.07	35.83	0.150	11	4.34
Utility	-	-	-	35.83	0.150	7	37.63
Deck	48.00	0.73	35.00	35.83	0.150	1	188.13
1st Int. Beam Overhang	2.33	0.82	1.92	35.83	0.150	2	20.64
Exterior Beam Overhang	1.33	0.50	0.67	35.83	0.150	2	7.17
Sidewalk	6.00	0.69	4.14	35.83	0.150	2	44.55
S3-TL4 Railing	-	-	-	35.83	0.090	2	6.45
							Total Sup. DC = 339.91 kips
							Total Sup. DC Reactions = 169.954 kips

	Width (ft)	Thick. (ft)	Area (ft ²)	Length (ft)	Unit Weight (kcf/klf)	Quantity	Load (kips)
Wearing Surface	0.00	0.00	0.00	35.83	0.150	1	0.00
						DW Reactions =	0.00 kips

Substructure Dead Loads

Substructure Length = 62.15 ft

	Width (ft)	Height (ft)	Area (ft ²)	Length (ft)	Unit Weight (kcf/klf)	Quantity	Load (kips)
Integral Abut.	3.50	2.60	9.11	62.15	0.150	2	169.93
Integral Abut. Chamfer	0.67	0.67	0.22	62.15	0.150	2	4.14
Footing	3.50	3.27	11.45	62.15	0.150	2	213.43
Micropiles (API N-80)	-	-	-	30.00	0.047	20	28.20
							Total Sub. DC = 415.71 kips
							Total Sub. DC Reactions (kips) = 207.85 kips



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PROPOSED LOADS

A-10-015 (7XF)

Live Loads

Roadway Width = 48.00 ft
Sidewalk Width (from railing face) = 9.25 (Both Sides)

Case 1 (Pedestrian ignored, travel width = out-to-out of bridge)

No. Lanes = 4.00
m = 0.65 (2) 3.10.2.2
Span Length = 32.33 ft

HL 93 Truck Loading

Lane Load = 0.640 klf (1) 3.6.1.2.4
Total Lane Load = 1.664 klf
Total Lane Load Reactions = 26.9013 kips

HS20 Truck Reactions = 51.00 kips AASHTO Stand. Specs. App. A
IM = 1.00 (2) 3.10.2.2
Total HS20 Truck Reactions = 132.60 kips

Total LL End Reactions = 159.50 kips

Case 2 (Pedestrian included, travel width = curb-to-curb of bridge)

No. Lanes = 4.00
m = 0.65
Span Length = 32.33 ft

HL 93 Truck Loading

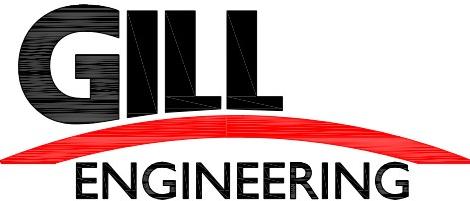
Lane Load = 0.640 klf (1) 3.6.1.2.4
Total Lane Load = 1.664 klf
Total Lane Load Reactions = 26.9013 kips

HS20 Truck Reactions = 51.00 kips AASHTO Stand. Specs. App. A
IM = 1.00 (2) 3.10.2.2
Total HS20 Truck Reactions = 132.60 kips

Pedestrian Live Loads

Pedestrian Load = 0.075 ksf (1) 3.6.1.6
Sidewalk Width = 6.00 ft
Quantity = 2.00
Pedestrian Reactions = 14.55 kips

Total LL End Reactions = 174.05 kips



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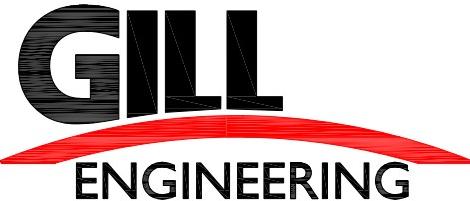
PROPOSED LOADS

A-10-015 (7XF)

Total Loading (Vertical Loads)

Factors are per AASHTO LRFD Bridge Design, 7th Edition, 2014 (thru 2016 interims), Table 3.4.1-1 & 3.4.1-2

	Load (kips)	γ	Importance Factor	γ^* Load (kips)	γ	γ^* Load (kips)
DC (Superstructure) =	169.95	1.25	1.05	223.06	1.00	178.45
DW =	0.00	1.50	1.05	0.00	1.00	0.00
DC (Substructure) =	207.85	1.25	1.05	272.81	1.00	203.44 (no pile selfweight)
EV =	0.00	1.00	1.05	0.00	1.00	0.00
LL =	<u>174.05</u>	1.75	1.05	<u>319.82</u>	1.00	<u>182.75</u>
Total =	<u>551.86</u>			<u>815.69</u>		<u>564.65</u>



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PROPOSED MICROPILES GEOTECHNICAL RESISTANCE

A-10-015 (7XF)

References:

(1) AASHTO LRFD Bridge Design, 7th Edition, 2014 (thru 2016 interims)

Axial Compression Resistance

$$R_C = \phi_C R_n = \phi_{qp} R_p + \phi_{qs} R_s$$

in which $R_p = q_p A_p$

$$R_s = q_s A_s$$

where: R_p = Nominal tip resistance (kips)

R_s = Nominal grout-to-ground resistance (kips)

ϕ_{qp} = Resistance factor for tip resistance

ϕ_{qs} = Resistance factor for grout-to-ground bond resistance

q_p = Unit tip resistance (ksf)

q_s = Unit grout-to-ground resistance (ksf)

A_p = Area of micropile tip (ft^2)

A_s = Area of grout-to-ground bond surface (ft^2)

(1) I.O.9.3.5.1-1

$$R_s = (\pi d_b a_b L_b)$$

(1) I.O.9.3.5.2-1

Grout-to-Ground Resistance

$$D_{casing} = 9.625 \text{ in} \quad (\text{API - N80})$$

$$t_{casing} = 0.435 \text{ in}$$

$$d_b = 8.755 \text{ in}$$

$$a_b = 5.00 \text{ ksf (Type B in Sand)}$$

(1) Table C10.9.3.5.2-1

$$L_b = 15.00 \text{ ft}$$

$$R_s = 171.904 \text{ kips}$$

$$\phi_{qs} = 0.55$$

(1) Table I.O.5.5.2.5-1

$$\phi_{qs} R_s = 94.55 \text{ kips}$$

Tip Resistance in Rock

Micropiles will not be bearing on rock.

Group Efficiency

$$\eta = 1.00 \quad (\text{piles in cohesionless soil})$$

(1) I.O.7.3.9

Micropile Group Compression Resistance

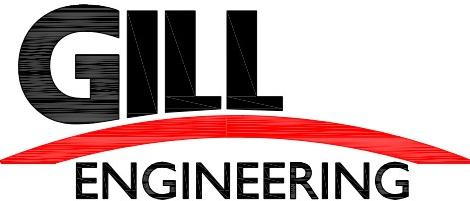
$$\text{Number of Piles, } N_b = 10$$

$$\eta \phi_{qs} R_s = 94.55 \text{ kips}$$

$$\text{Total } \eta \phi_{qs} R_s = 945.5 \text{ kips}$$

$$\phi P_u = 815.69 \text{ kips}$$

$$F.S. = 1.16$$



CLIENT TOWN OF ARLINGTON
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PROPOSED MICROPILES STRUCTURAL RESISTANCE

A-10-015 (7XF)

References:

(1) AASHTO LRFD Bridge Design, 7th Edition, 2014 (thru 2016 interims)

Axial Compressive Resistance

$$R_c = \phi_c R_n$$

(1) 10.9.3.10.2-1

where: ϕ_c = Resistance factor for structural resistance of micropiles in axial compression

R_n = nominal axial compression resistance of micropile (kips)

$$\phi_{cc} = 0.75$$

(1) 10.5.5.2.5-2

$$\phi_{cu} = 0.75$$

(1) 10.5.5.2.5-2

Cased Length

$$R_{cc} = \phi_{cc} R_n$$

(1) 10.9.3.10.2a-1

$$R_n = 0.85[0.85f_c A_g + f_y(A_b + A_o)]$$

(1) 10.9.3.10.2a-2

$$D_{casing} = 9.63 \text{ in (API N-80 Pipe)}$$

$$t_{casing} = 0.435 \text{ in}$$

$$A_c = 12.56 \text{ in}^2$$

$$D_{rebar} = \# 11 = 1.41 \text{ in}$$

$$A_b = A_{rebar} = 1.56 \text{ in}^2$$

$$f_c = 4.00 \text{ ksi}$$

$$D_{grout} = 7.35 \text{ in}$$

$$A_g = A_{grout} = 42.37 \text{ in}^2$$

$$f_y_Casing = 80.00 \text{ ksi}$$

$$f_y_Rebar = 75.00 \text{ ksi}$$

$$E = 29000 \text{ ksi}$$

$$0.003E = 87.00 \text{ ksi}$$

$$\text{Use min } f_y = 75.00 \text{ ksi}$$

$$R_n = 1023 \text{ kips}$$

$$\phi_{cc} R_n = 767 \text{ kips}$$

Uncased Length

$$R_{cu} = \phi_{cu} R_n$$

(1) 10.9.3.10.2b-1

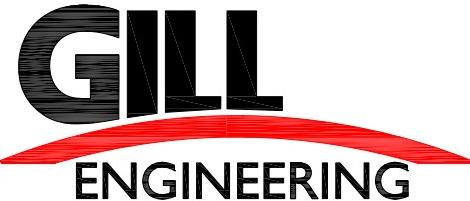
$$R_n = 0.85[0.85f_c A_g + f_y A_b]$$

(1) 10.9.3.10.2b-2

$$A_b = 1.56 \text{ in}^2$$

$$f_c = 4.00 \text{ ksi}$$

$$A_g = A_{grout} = 42.37 \text{ in}^2$$



CLIENT TOWN OF ARLINGTON
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PROPOSED MICROPILES STRUCTURAL RESISTANCE

A-10-015 (7XF)

References:

(1) AASHTO LRFD Bridge Design, 7th Edition, 2014 (thru 2016 interims)

$$\begin{aligned}f_y_{Rebar} &= 75.00 \text{ ksi} \\0.003E &= 87.00 \text{ ksi} \\\text{Use min } f_y &= 42.37 \text{ ksi}\end{aligned}$$

$$\begin{aligned}R_{CU} &= 179 \text{ kips} \\\phi_{CU} R_n &= 134 \text{ kips}\end{aligned}$$

Axial Tension Resistance

$$R_T = \phi_T R_n \quad (1) 10.9.3.10.2-1$$

where: ϕ_T = Resistance factor for structural resistance of micropiles in axial tension

R_n = nominal axial tension resistance of micropile (kips)

$$\begin{aligned}\phi_{TC} &= 0.80 \quad (1) 10.5.5.2.5-2 \\\phi_{TU} &= 0.80 \quad (1) 10.5.5.2.5-2\end{aligned}$$

Cased Length

$$\begin{aligned}R_{TC} &= \phi_{TC} R_n \quad (1) 10.9.3.10.3a-1 \\R_n &= f_y (A_b + A_{ct}) \quad (1) 10.9.3.10.3a-2\end{aligned}$$

$$\begin{aligned}A_c &= 12.56 \text{ in}^2 \\A_b = A_{rebar} &= 1.56 \text{ in}^2\end{aligned}$$

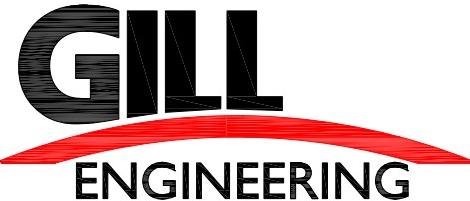
$$\begin{aligned}f_y_{Casing} &= 80.00 \text{ ksi} \\f_y_{Rebar} &= 75.00 \text{ ksi} \\\text{Use min } f_y &= 75.00 \text{ ksi}\end{aligned}$$

$$\begin{aligned}R_n &= 1059.0 \text{ kips} \\\phi_{TC} R_n &= 847.226 \text{ kips}\end{aligned}$$

Uncased Length

$$\begin{aligned}R_{TU} &= \phi_{TU} R_n \quad (1) 10.9.3.10.3b-1 \\R_n &= f_y A_b \quad (1) 10.9.3.10.3b-2\end{aligned}$$

$$\begin{aligned}\text{Use } f_y &= f_y_{Rebar} = 75.00 \text{ ksi} \\A_b = A_{rebar} &= 1.56 \text{ in}^2 \\R_n &= 117.11 \text{ kips} \\\phi_{TU} R_n &= 93.69 \text{ kips}\end{aligned}$$



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PROPOSED MICROPILES STRUCTURAL RESISTANCE

A-10-015 (7XF)

References:

(1) AASHTO LRFD Bridge Design, 7th Edition, 2014 (thru 2016 interims)

Plunge Length Transfer Load

$$P_T = \phi(\pi d_b a_b L_p) \quad (1) 10.9.3.10.4-1$$

$$\phi = \phi_{stat} = 0.55 \quad (1) Table 10.5.5.2.5-1$$

$$d_b = 8.76 \text{ in}$$

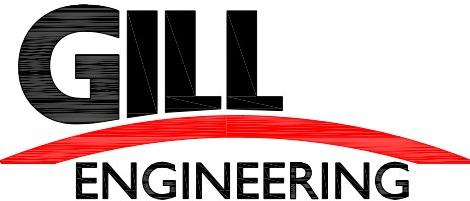
$$a_b = 5.00 \text{ ksf (Type B in Sand)} \quad (1) Table C10.9.3.5.2-1$$

$$L_p = 1.00 \text{ ft}$$

$$\phi P_T = 6.30 \text{ kips}$$

Structural Capacity Summary

	Compression		Tension	
	$\phi_{CC} R_n$ (kips)	$\phi_{CU} R_n$ (kips)	$\phi_{TC} R_n$ (kips)	$\phi_{TU} R_n$ (kips)
Number of Piles, N_b =	10	10	10	10
ϕP_u (kips) =	815.69	815.69	815.69	815.69
ϕP_u per pile (kips) =	81.57	81.57	81.57	81.57
ϕP_T (kips) =	0.00	6.30	0.00	6.30
Pile Resistance =	766.97	134.02	847.23	93.69
F.S. =	9.40	1.78	10.39	1.24



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PROPOSED MICROPILES COMBINED COMPRESSION & FLEXURE CHECK

A-10-015 (7XF)

References:

(1) AASHTO LRFD Bridge Design, 7th Edition, 2014 (thru 2016 interims)

Combined Axial Compression and Flexure

$$P_u = 81.57 \text{ kips (per pile)}$$

See Structural Cap Calcs

$$P_r = 766.97 \text{ kips (per pile)}$$

See Structural Cap Calcs

$$M_u = 202.62 \text{ k-in (per pile)}$$

Lpile Outputs

Factored Flexure Resistance

$$M_r = \phi_f M_n$$

$$\phi_f = 1.00$$

(1) 6.5.4.2

$$D = 9.63 \text{ in}$$

$$t = 0.44 \text{ in}$$

$$E = 29000 \text{ ksi}$$

$$F_y = 80.00 \text{ ksi}$$

For $D/t < 2\sqrt{E/F_y}$

$$M_n = M_{ps}$$

(1) 6.12.2.3.2-1

For $2\sqrt{E/F_y} < D/t \leq 8.8\sqrt{E/F_y}$

$$M_n = M_{yc}$$

(1) 6.12.2.3.2-2

$$D/t = 22.13$$

$$2\sqrt{E/F_y} = 38.08$$

$$8.8\sqrt{E/F_y} = 167.55$$

Use $M_n = M_{ps}$

$$F_u = 100 \text{ ksi}$$

$$Z = 36.77 \text{ in}^3$$

$$\phi_f M_r = 3677 \text{ k-in (per pile)}$$

For $P_u/P_r < 0.2$

$$\frac{P_u}{2.0P_r} + \frac{(M_{ux})}{(M_{rx})} + \frac{(M_{uy})}{(M_{ry})} \leq 1.00$$

(1) 6.9.2.2-1

For $P_u/P_r \geq 0.2$

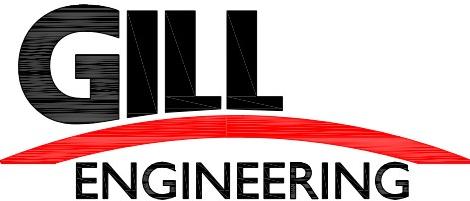
$$\frac{P_u}{P_r} + \frac{8.00}{9.00} \frac{(M_{ux})}{(M_{rx})} + \frac{(M_{uy})}{(M_{ry})} \leq 1.00$$

(1) 6.9.2.2-2

$$P_u/P_r = 0.11$$

Then

$$\frac{82}{1534} + \frac{(203)}{(3677)} + \frac{(203)}{(3677)} \leq 0.11$$



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SETTLEMENT

A-10-015 (7XF)

References:

(1) AASHTO LRFD Bridge Design, 7th Edition, 2014 (thru 2016 interims)

Footing Geometry & Loading

D _f =	6.604	ft (from roadway)
B =	0.80	ft
L =	50.52	ft
Pile Depth = D =	30.00	ft
D' = 2/3D =	20.00	ft
B ₁ =	10.80	ft (1H:4V)
L ₁ =	60.52	ft (1H:4V)

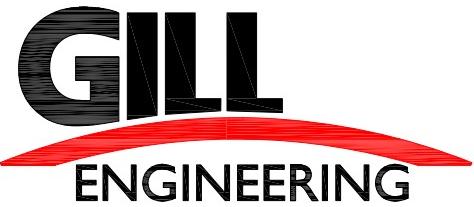
(1) Figure 10.7.2.3.1-1

(1) Figure 10.7.2.3.1-1

Pile Group Settlement in Cohesionless soils

Per 10.7.2.3.2 other methods for computing settlement in cohesionless soil such as the hough method as specified in Article 10.6.2.4.2 may also be used in connection with the equivalent footing approach.

	Layer 1	Layer 2	
$\gamma =$	0.120	0.120	kcf
Start =	20.00	25.00	ft
End =	25.00	30.00	ft
H _c =	5.00	5.00	ft
Ground elevation to H _c /2 =	29.10	36.60	ft
$h_{water} =$	0.00	0.00	ft
h_1 (above water) =	0.00	0.00	ft
h_2 (below water) =	29.10	36.60	ft
$\sigma'_o =$	1.68	2.11	ksf
$P_u =$	564.65	564.65	kips
$z =$	2.50	7.50	ft
B ₁ =	13.30	18.30	ft (1H:2V)
L ₁ =	63.02	68.02	ft (1H:2V)
$\Delta\sigma_v = q_u = P_u/B_1 L_1 =$	0.67	0.45	ksf
$\sigma'_o + \Delta\sigma_v =$	2.35	2.56	ksf
N ₁₆₀ =	24	32	See Soil Properties Calcs
C' =	85	110	(1) Figure 10.6.2.4.2-1
$\Delta H =$	0.104	0.046	in
Total Settlement =	0.150	in	



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LPILE - Critical Pile Length

A-10-015 (7XF)

The required cased length of the micropile was determined using Lpile.

The soil profile is defined in Lpile as two layers with the following properties:

Upper Layer: Medium sand layer from 0 ft. to 6 ft. with friction angle of 32 degrees.

Lower Layer: Medium dense sand layer from 6 ft. to 30 ft. with a friction angle of 34 degrees.

Lateral loads from 10 kips to 100 kips (Case 1 to Case 10) were applied to the pile head with no axial loads, and pile-head deflections were generated for different cased lengths to check the pile critical length.

Assuming a maximum of 0.25 inches of thermal movement, it was determined that a cased length of 15 feet would be adequate.

=====

LPILE PLUS FOR WINDOWS, VERSION 6 (6.0.22)

Analysis of Individual Piles and Drilled Shafts

Subjected to Lateral Loading Using the p-y Method

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=====

This program is licensed to:

Gill Engineering Associates

Needham, MA

Files Used for Analysis

Path to file locations: \\GILLSERVER\\Dropbox\\Arlington A10015\\Calculations\\FB\\LPILE\\

Name of input data file: A10015 - Micropiles - Lcritical.ip6d

Name of output report file: A10015 - Micropiles - Lcritical.ip6o

Name of plot output file: A10015 - Micropiles - Lcritical.ip6p

Name of runtime message file: A10015 - Micropiles - Lcritical.ip6r

Date and Time of Analysis

Date: December 20, 2017 Time: 12:16:45

Problem Title

Project Name: Arlington

Job Number: A-10-015 (7XF)

Client: Town of Arlington

Engineer: FB

Description: Micropiles

Program Options

Engineering units are US Customary Units: pounds, inches, feet

Basic Program Options:

This analysis computes nonlinear bending stiffness and nominal moment capacity with pile response computed using nonlinear EI

Computation Options:

- Only internally-generated p-y curves used in analysis
- Analysis does not use p-y multipliers (individual pile or shaft action only)
- Analysis assumes no shear resistance at pile tip
- Analysis for fixed-length pile or shaft only
- No computation of foundation stiffness matrix elements
- Output pile response for full length of pile
- Analysis assumes no soil movements acting on pile
- No p-y curves to be computed and output for user-specified depths

Solution Control Parameters:

- Number of pile increments = 100
- Maximum number of iterations allowed = 100
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in

Pile Response Output Options:

- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
 - Printing Increment (nodal spacing of output points) = 1
-

Pile Structural Properties and Geometry

Total Number of Sections = 2

Total Pile Length = 30.00 ft

Depth of ground surface below top of pile = -11.00 ft

Slope angle of ground surface = 0.00 deg.

Pile dimensions used for p-y curve computations defined using 4 points.

p-y curves are computed using values of pile diameter interpolated over the length of the pile.

Point Depth Pile

X Diameter

ft in

1 0.00000 9.6250000

2 15.000000 9.6250000

3 15.000000 8.6810000

4 30.000000 8.6810000

Input Structural Properties:

Pile Section No. 1:

Section Type = Drilled Shaft with Permanent Casing

Section Length = 15.000 ft

Pile Width = 9.625 in

Pile Section No. 2:

Section Type = Drilled Shaft (Bored Pile)

Section Length = 15.000 ft

Section Diameter = 8.681 in

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees

= 0.000 radians

Pile Batter Angle = 0.000 degrees

= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 2 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = -11.000 ft

Distance from top of pile to bottom of layer = -5.000 ft

p-y subgrade modulus k for top of soil layer = 20.000 lbs/in**3

p-y subgrade modulus k for bottom of layer = 20.000 lbs/in**3

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = -5.000 ft

Distance from top of pile to bottom of layer = 35.000 ft

p-y subgrade modulus k for top of soil layer = 60.000 lbs/in**3

p-y subgrade modulus k for bottom of layer = 60.000 lbs/in**3

(Depth of lowest layer extends 5.00 ft below pile tip)

Effective Unit Weight of Soil vs. Depth

Effective unit weight of soil with depth defined using 4 points

Point Depth X Eff. Unit Weight

No. ft pcf

1 -11.00 57.60000

2 -5.00 57.60000

3 -5.00 57.60000

4 35.00 57.60000

Summary of Soil Properties

Layer Rock Emass	Soil Type krm	Depth Test Type	Eff. Unit Test Prop.	Cohesion Elas. Subgr.	Friction qu	RQD	Epsilon 50	kpy	
Num. psi	(p-y Curve Criteria) pci		ft	Wt., pcf	psf	Ang., deg.	psi	percent	pci
1	Sand (Reese, et al.)		-11.000	57.600	--	32.000	--	--	20.000
--	--	--	--						
			-5.000	57.600	--	32.000	--	--	20.000
--	--	--	--						
2	Sand (Reese, et al.)		-5.000	57.600	--	34.000	--	--	60.000
--	--	--	--						
			35.000	57.600	--	34.000	--	--	60.000
--	--	--	--						

Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 10

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust
Force, lbs				
1	2	V = 10000.000 lbs	S = 0.000 in/in	0.000
2	2	V = 20000.000 lbs	S = 0.000 in/in	0.000
3	2	V = 30000.000 lbs	S = 0.000 in/in	0.000
4	2	V = 40000.000 lbs	S = 0.000 in/in	0.000
5	2	V = 50000.000 lbs	S = 0.000 in/in	0.000

6	2	V =	60000.000 lbs	S =	0.000 in/in	0.000
7	2	V =	70000.000 lbs	S =	0.000 in/in	0.000
8	2	V =	80000.000 lbs	S =	0.000 in/in	0.000
9	2	V =	90000.000 lbs	S =	0.000 in/in	0.000
10	2	V =	100000.000 lbs	S =	0.000 in/in	0.000

V = perpendicular shear force applied to pile head

M = bending moment applied to pile head

y = lateral deflection relative to pile axis

S = pile slope relative to original pile batter angle

R = rotational stiffness apply to pile head

Axial thrust is assumed to be acting axially

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003

or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	0.000	2824.132	0.00300000

Note note that the values of moment capacity in the table above are not

factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether
the transverse reinforcing steel bars are spirals or tied hoops.

The above values should be multiplied by the appropriate strength reduction
factor to compute ultimate moment capacity according to ACI 318-08, Section
9.3.2.2 or the value required by the design standard being followed

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 2

Moment values interpolated at maximum compressive strain = 0.003

or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	0.000	159.441	0.00300000

Note note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318-08, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are spirals or tied hoops.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318-08, Section 9.3.2.2 or the value required by the design standard being followed.

Summary of Pile Response(s)

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, lbs, and Load 2 = Moment, in-lbs

Load Type 2: Load 1 = Shear, lbs, and Load 2 = Slope, radians

Load Type 3: Load 1 = Shear, lbs, and Load 2 = Rotational Stiffness, in-lbs/radian

Load Type 4: Load 1 = Top Deflection, inches, and Load 2 = Moment, in-lbs

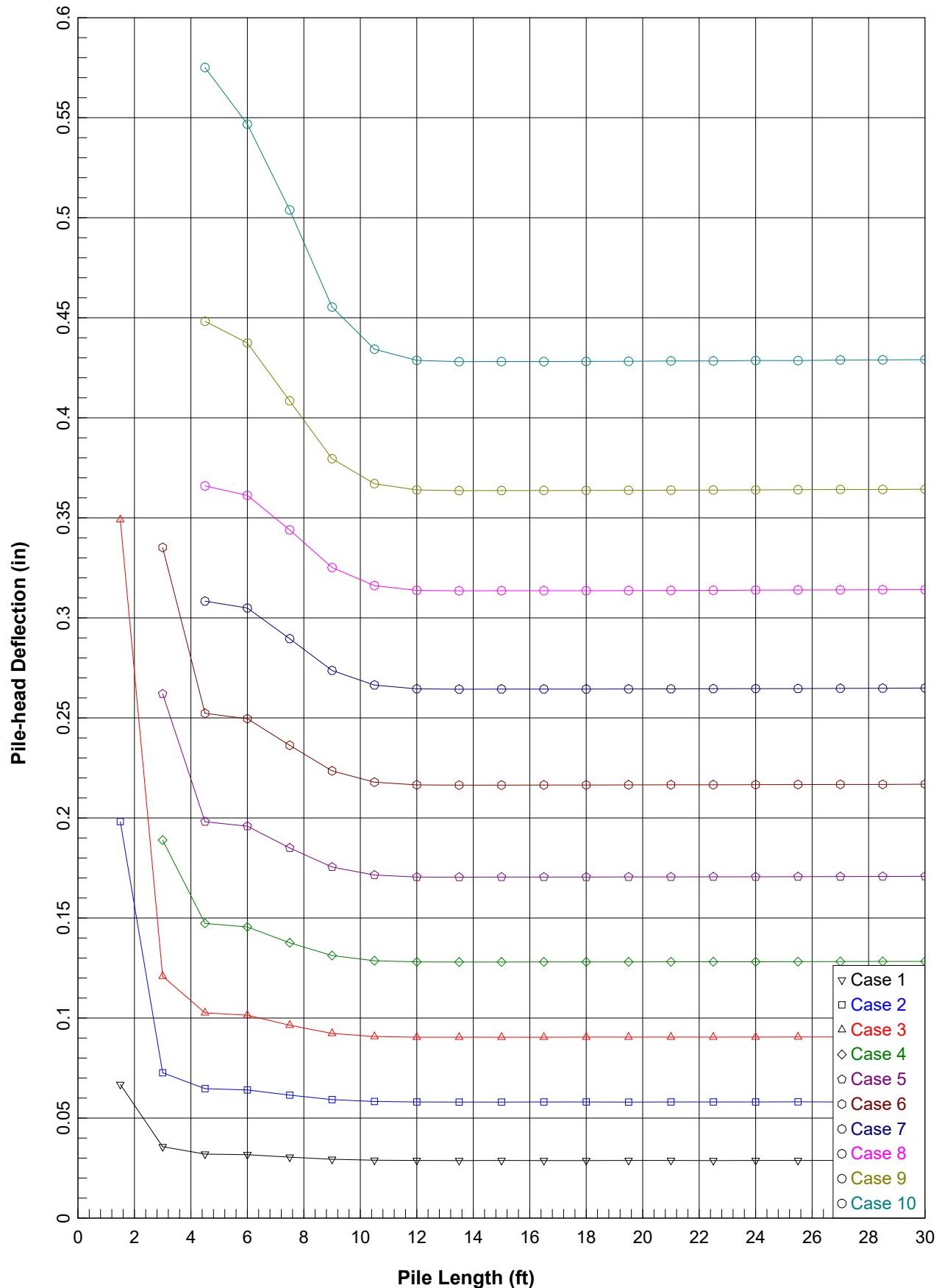
Load Type 5: Load 1 = Top Deflection, inches, and Load 2 = Slope, radians

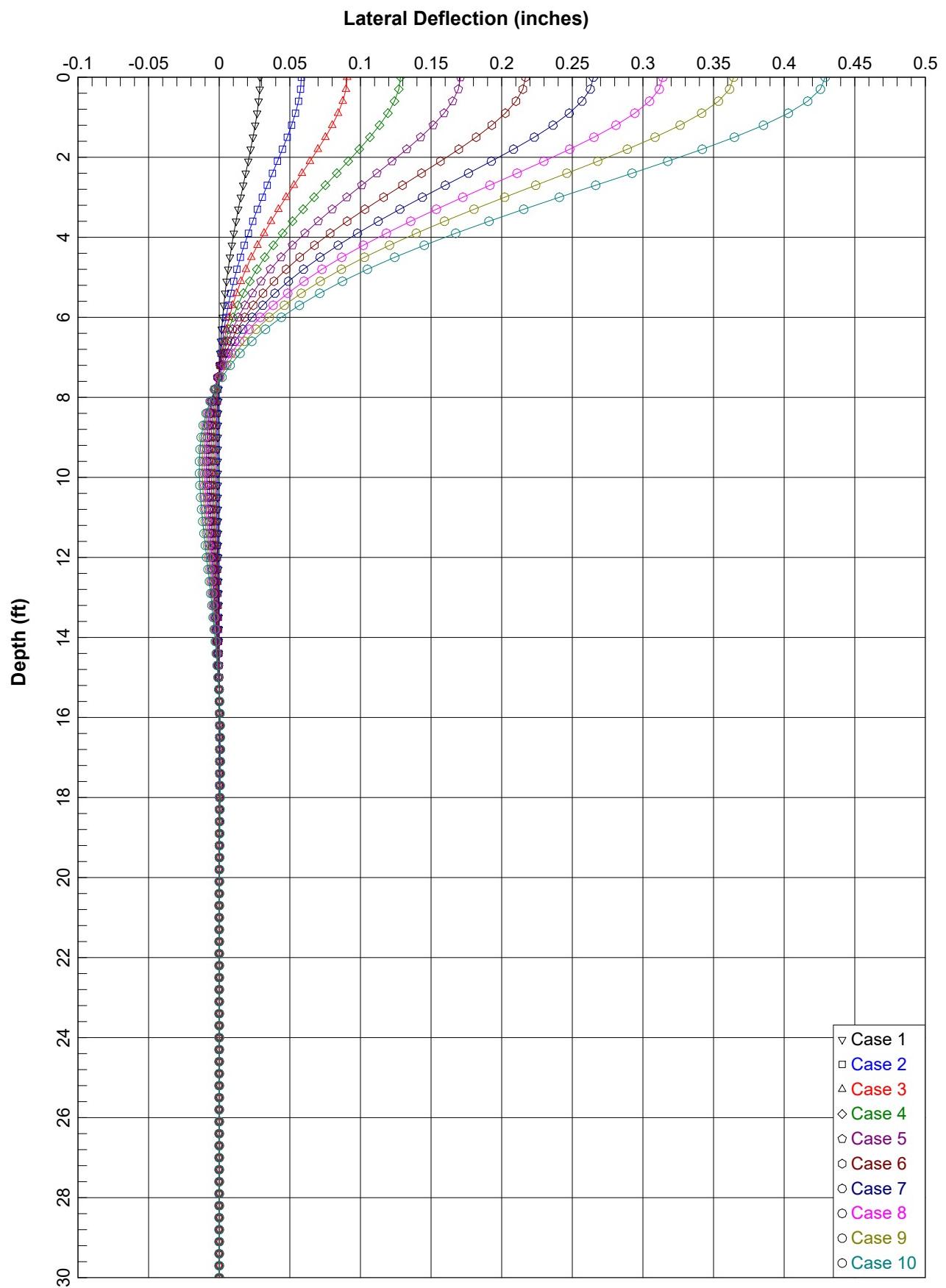
Pile-head Pile-head

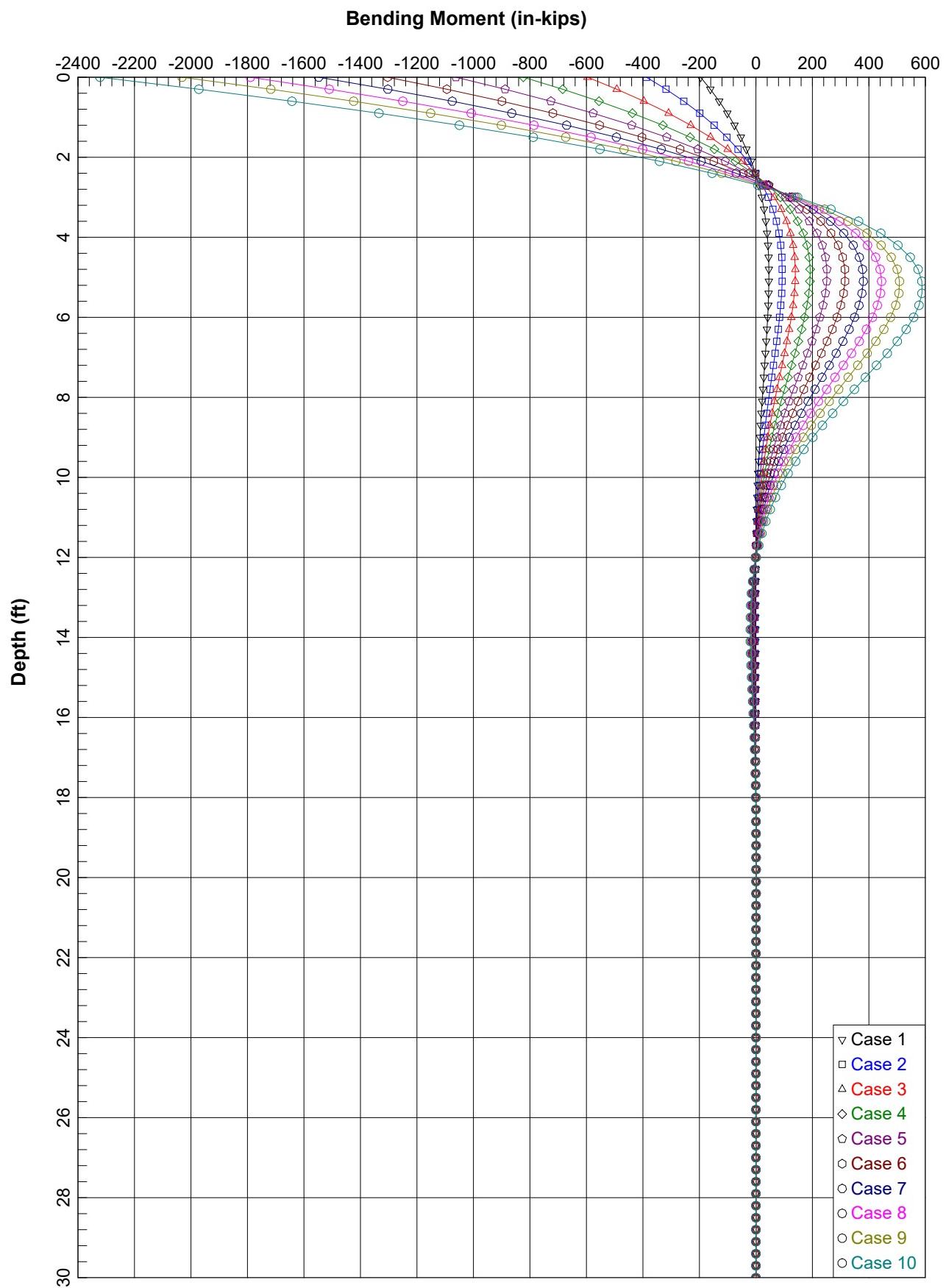
Load Case	Load Type	Condition 1 V(lbs) or y(inches)	Condition 2 in-lb, rad., or in-lb/rad.	Axial Loading	Pile-head Deflection	Maximum Moment in-lbs	Maximum Shear lbs	Maximum Pile-head Rotation radians
				lbs	inches	in-lbs	lbs	radians

1	2	V = 10000.0000	S = 0.000	0.0000000	0.02890006	-195952.	10000. 0.00000000
2	2	V = 20000.	S = 0.000	0.0000000	0.05814088	-387547.	20000. 0.00000000
3	2	V = 30000.	S = 0.000	0.0000000	0.09060664	-596443.	30000. 0.00000000
4	2	V = 40000.	S = 0.000	0.0000000	0.12830762	-823466.	40000. 0.00000000
5	2	V = 50000.	S = 0.000	0.0000000	0.17080153	-1062059.	50000. 0.00000000
6	2	V = 60000.	S = 0.000	0.0000000	0.21689211	-1303562.	60000. 0.00000000
7	2	V = 70000.	S = 0.000	0.0000000	0.26492025	-1547350.	70000. 0.00000000
8	2	V = 80000.	S = 0.000	0.0000000	0.31412432	-1789756.	80000. 0.00000000
9	2	V = 90000.	S = 0.000	0.0000000	0.36428254	-2031828.	90000. 0.00000000
10	2	V = 100000.	S = 0.000	0.0000000	0.42904187	-2322279.	100000. 0.00000000

The analysis ended normally.





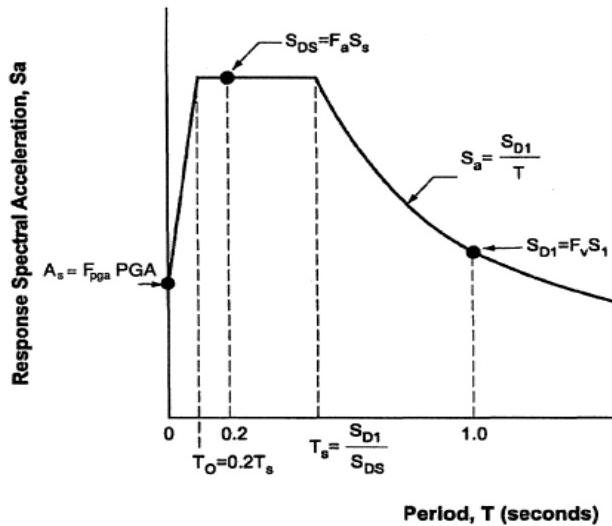


Develop Response Spectrum for Mystic Street, Arlington, MA - 2500 Year Return Event

Reference:

1. 2011 AASHTO Guide Specifications, LRFD Seismic Bridge Design, Interims Through 2015

Soil Site Class =	D	Stiff soil, $15 < N < 50$ blows/ft	Ref 1-Table 3.4.2.1-1
PGA: Peak Ground Acceleration =	0.15		Ref 1-Figure 3.4.1-2b
S_5 : Spectral Accel at $T=0.2$ sec =	0.25		Ref 1-Figure 3.4.1-3b
S_1 : Spectral Accel at $T=1.0$ sec =	0.075		Ref 1-Figure 3.4.1-4b
$F_{pga} = F_a$: Site Coefficient at $T=0.2$ sec =	1.6		Ref 1-Table 3.4.2.3-1
F_v : Site Coefficient at $T=1.0$ sec =	2.4		Ref 1-Table 3.4.2.3-2
$A_s = F_{pgs} \times PGA =$	0.240 G	Acceleration Coefficient	
$S_{DS} = F_a \times S_5 =$	0.400 G	Spectral Coefficient at $T=0.2$ sec	
$S_{D1} = F_v \times S_1 =$	0.180 G	Spectral Coefficient at $T=1.0$ sec	
SDC: Seismic Design Category =	B	$SD_A > 0.15$	Ref 1-Table 3.5-1
$T_s = SD_1 / SD_S =$	0.45 Sec		
$T_o = 0.2 \times T_s =$	0.09 Sec		



Ordinates for Plot of Spectral Accel Curve
vs. Period

T	Sa
0.00 Sec	0.24 G
0.09 Sec	0.40 G
0.10 Sec	0.40 G
0.20 Sec	0.40 G
0.45 Sec	0.40 G
0.30 Sec	0.40 G
0.40 Sec	0.40 G
0.50 Sec	0.36 G
0.60 Sec	0.30 G
0.70 Sec	0.26 G
0.80 Sec	0.23 G
0.90 Sec	0.20 G
1.00 Sec	0.18 G
1.10 Sec	0.16 G
1.20 Sec	0.15 G

APPENDIX C: Hydraulic Design Report



westonandsampson.com

273 Dividend Road
Rocky Hill, CT 06067
tel: 860.513.1473

REPORT

Hydraulic Design Report

December 2017

Mystic Street Bridge Replacement

Arlington, MA

Prepared for:

Town of Arlington

Prepared by:

Weston & Sampson



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1.0 INTRODUCTION

This report describes the hydraulic analysis and design for the Replacement of the Mystic Street Bridge (Bridge # A-10-015 (7XF)). The Mystic Street Bridge over Mill Brook # 3 is located on Route 3 in Arlington, MA, approximately south of the Arlington Police/ Fire Departments (112 Mystic Street). Mill Brook #3 flows from west to east beneath the Mystic Street Bridge. Mill Brook continues to flow east and then north and discharges into Lower Mystic Lake. The section of Mystic Street that crosses over the bridge is oriented along a northwest to southeast alignment. The location map, included on Page 2, shows the bridge and the surrounding roadway configurations.

The bridge is located within the FEMA Flood Zone AE with a regulatory floodway, as shown on the FEMA FIRM Map FM 25017C0417E. The bridge is located between the FEMA cross sections E and F. A copy of FEMA Map is included in Appendix A.

The existing 2-span bridge has been rated poor structurally and warrants replacement. The replacement structure will be an integral abutment structure, consisting of an exposed reinforced concrete deck composite with rolled steel stringers. The proposed abutments will be located behind the existing granite abutments, and upper portions of the existing granite abutments will be removed.

2.0 DESIGN DISCHARGES

Design flows at the project site were evaluated under a variety of hydrologic conditions. The frequency interval of these flows ranged from the 2-year to the 500-year flood events. Multiple methodologies were conducted to estimate the design flows. Methods included two different sets of regression equations and the statistical analysis of USGS peak streamflow data in two nearby rivers. These design flows are included below in Table 1. The design flows used in the hydraulic mode were calculated with the USGS peak streamflow data method for Old Swamp River gage.

The FEMA flows were published in FEMA's Flood Insurance Study Volume 1 of 8 for Middlesex County, Massachusetts. The flow upstream of FEMA Cross Section F at Mill Street was selected. At Mill Street, the drainage area to Mill Brook #3 is 5.05 sq. miles.

One set of regression equations was developed by the USGS to estimate discharge in unregulated rivers and streams in the State of Massachusetts. These flows were estimated for the project site using the web-based USGS tool, StreamStats. The StreamStats equations are a function of drainage area, average watershed slope, and the amount of underlying stratified drift aquifer per stream length. A second set of regression equations was developed for the New England Transportation Consortium (NETC) to estimate discharge in unregulated steep-gradient streams throughout New England. The NETC equations are a function of drainage area and annual total precipitation. Both sets of regression equations, StreamStats and NETC were developed for unregulated waterways, while the StreamStats equations are most applicable to rural settings and the NETC method is most applicable to relatively steep streams. the Mill River watershed is relatively shallow sloped, located in an urbanized area, and regulated by numerous culverts and other stormwater infrastructure.

Statistically-based design flow estimates were developed using historical peak streamflow data recorded by USGS gages in two nearby rivers. One gage, #01100568, is located on the Shawsheen

River near Bedford and has 21 years of data. The drainage area contributing to the Shawsheen River at that gage is approximately 2.13 sq. miles. The second gage, #01105600, is located on Old Swamp River near South Weymouth and has 50 years of data. The drainage area contributing to the Old Swamp River at that gage is approximately 4.50 sq. miles. Both data sets were analyzed with the USGS-standard Log Pearson Type III Bulletin 17B (LP3) statistical method. While neither watershed monitored by the USGS gages is as urbanized as that of the project site's watershed, their drainage areas are relatively similar to that of the project site (5.05 sq. miles) and neither are significantly regulated by dams or culverts.

Both sets of regression equations will tend to underestimate design flows for the urban, shallow, regulated Mill River. In this case, NETC did not underestimate, but it was by chance more than design. The LP3 Old Swamp method comes up with very similar data, but is significantly more appropriate/defensible. Given the appropriateness of the LP3 method, the similar watershed size (4.50 vs. 5.05 sq. miles), and the 50-years of historical data, the design flows developed from the Old Swamp River USGS gage data were determined to be the most applicable to the project site. Mystic Street is classified as Rural Principal Arterial Street and therefore by guidelines in Mass DOT LRFD Bridge Manual, the design discharge is the 50-year frequency flood event. Hydrologic computations are included in Appendix B.

Table 1 – Design Flows

Return Frequency (Years)	FEMA (cfs)	StreamStats (cfs)	NETC (cfs)	LP3 USGS Shawsheen (cfs)	LP3 USGS Old Swamp (cfs)
2	-	149	204	770	201
5	-	244	325	1167	338
10	150	318	436	1453	449
25	-	426	586	1839	612
50	310	516	704	2142	750
100	450	610	832	2459	904
200	-	713	1001	2791	1075
500	730	861	1241	3163	1207

FEMA flows were used for the FEMA and floodway runs in the hydraulic model. The design discharges are approximately 2.4 times greater than the FEMA flows. It should be noted that, design discharges are overly conservative compared to FEMA flows and as such FEMA flows were used for the hydraulic and scour analysis.



Figure 1 – Location Map

3.0 EXISTING CONDITIONS

The Mystic Street Bridge is over 150-years old, and the bridge has severe deficiencies, which require repairs. The state of the bridge is described in Massachusetts Department of Transportation Structures Field Report from January 21, 2015. The original structure was built around 1850 with granite slabs and masonry walls for the pier and abutments. In 1958, the structure was widened with reinforced concrete slabs. Portions of the original granite slab have been strengthened with steel stringers sometime after the 1958 widening. The width of the existing structure consists of a 48-foot roadway and two 6-foot wide sidewalks. The length of the original 1850 structure is 21 feet while the lengths on the 1958 widened structure were extended out to 32.33 feet and 35.58 feet, on the west and east sides, respectively. The wearing surface of the roadway and sidewalks contains multiple cracks. The asphalt overlay on the west sidewalk has broken apart and reinforcing bars are exposed. There are hairline fractures in the superstructure. There are several stones missing from the walls of the substructure. There is moderate scour at the upstream end of the structure, and there is pile of debris located at the southwest embankment.

In the immediate vicinity of the Mystic Street Bridge, Mill Brook flows in a west to east direction. The main channel is approximately 21.5 feet wide. The main channel consists of cobbles with intermittent sand deposits. The brook has moderate to steep slopes within the project area with intermittent riffles. The northern upstream banks have a tiered slope that is composed of concrete steps. The southern

upstream side contains a steep slope with medium sized trees. The northern bank on the downstream side is bound by the wall supporting a building. Similarly, the southern bank on the upstream side is also bounded by the wall. The site has many utilities located within the roadway corridor and within the bridge crossing which include:

Below Roadway and Above Streambed:

- 1-8" gas line below at west sidewalk below concrete slab (exposed)
- 4-3.5" electric lines located within the roadway and above granite slabs
- 1-8" gas line within roadway and below granite slabs (exposed)
- 1-12" steel gas line within roadway and above granite slabs
- 8-3.5" electric lines located within the roadway and above granite slabs
- 1-8" gas line within roadway and below granite slabs (exposed)
- 1-6" steel unknown line and below granite slabs
- 2-12" electrical high-voltage black lines below east sidewalk below concrete slab
- 3-6" VCP drainage pipes through north abutment
- 1-12" RCP drainage pipe through north abutment
- 3-10" CIP drainage pipe through south abutment

Below Streambed:

- 2-10" MWRA Sanitary Sewer line at west sidewalk location
- 2-8" water lines within roadway corridor
- 2-8" cast iron Town siphon sewer lines within roadway corridor

Overhead:

- Overhead lines along west edge

4.0 PROPOSED STRUCTURE

The proposed bridge will be a single 32'-4" span integral abutment type structure, consisting of an exposed reinforced concrete deck composite with rolled steel stringers (W24x62) cast integrally with abutment diaphragms that are supported by a single row of micropiles. The proposed abutments will be located behind the existing granite abutments, and upper portions of the existing granite abutments will be removed.

The utility conflicts and site constraints pose challenges during construction. Some of the constraints include:

- There are numerous utilities within the roadway corridor as indicated in the previous section that need to be maintained, protected, and supported-in-place during construction.
- There is a utility pole in the Southwest quadrant – construction of the proposed abutment will require SOE for the pole to remain during construction.
- The MWRA sanitary sewer manhole structures limit the width of the proposed abutments.
- Groundwater was not measured during the subsurface exploration due to the rotary wash method. Therefore, the water table is assumed to be at the stream channel elevation of 9.0. Fluctuations with this elevation are expected with the seasonal flows of the stream. A bottom

of footing below this elevation will require dewatering during construction in order to maintain construction in the dry.

- The site has adjacent buildings located at the southwest and northeast quadrant of the bridge.
- Since the bridge site is located within an urban setting, other abandoned foundations and utilities, bricks or cobbles may be present within the subsurface of the site. The existing 1958 widening plans did note boulders in the upper 20 feet. Additionally, abandoned streetcar rails are known to exist below the southbound roadway surface.

5.0 HYDRAULIC MODEL

HEC-RAS, hydraulic model was used to evaluate the hydraulic conditions for the culvert replacement project. FEMA model for the study area was not available, therefore an existing conditions design model was developed by using hydraulic cross-sections based on field survey and state GIS topography using a vertical datum of NAVD88. The existing conditions design model consists of 8 cross-sections (5 upstream and 3 downstream) along a 458-foot reach of the brook which includes the Mystic Street crossing. The downstream end of the model is located 75 feet downstream of the Mystic Street Bridge to match the location of FEMA cross-section E and the upstream end is located 279 feet upstream of Mystic Street Bridge to match the location of FEMA cross-section F. A cross-section location map is included in Appendix A.

Manning's roughness coefficients were defined based on aerial photography and field observation. Contraction and expansion coefficients were estimated based on observed field conditions. Ineffective flow limits due to the roadway embankments were established based on assuming an area of non-conveyance. The boundary conditions were set to normal depth (known slope) for the upstream end while the boundary conditions for the downstream end were set to known water surface elevations based on FEMA FIS profiles. In accordance with typical modeling guidelines, the design models were run assuming mixed flow conditions and the FEMA models were run assuming sub-critical flow conditions. FEMA Floodway stations are established by approximately scaling from the effective FEMA map for the FEMA cross-sections E and F as well as for the surveyed cross-sections.

Results of the existing and proposed conditions for the design, FEMA and floodway conditions are included in Appendices D and E. Existing hydraulic conditions analysis indicates the bridge overtops during the 25-year design flows but can adequately convey the FEMA 100-year flows without overtopping. It should be noted that the design flows appear to be overly conservative. Removal of existing pier in combination with proposed widening results in increasing the hydraulic opening by approximately two times (existing 55 sq. ft. to proposed 100 sq. ft.). Proposed hydraulic conditions analysis indicates the bridge overtops during the 50-year design flows but can adequately convey the FEMA 100-year flows with improved freeboard upstream. An increase in the FEMA 100-year as well as the floodway elevations was observed at the downstream face of the bridge. This increase is a result of decrease in velocities through the proposed structure due to increased hydraulic opening. The 100-year and floodway increases at the downstream face are limited to within the roadway right-of-way and confined to the main channel. The increases do not cause adverse impacts to any adjacent properties. Efforts to eliminate such increases may result in significantly reducing the proposed hydraulic opening which in turn will increase the flooding potential at the bridge compared to the proposed conditions.

A preliminary temporary conditions hydraulic analysis was performed to evaluate the options for water handling during construction. Construction will be performed in multiple stages to remove the existing structure and install the proposed structure.

A digital copy of the hydraulic model is included in a CD.

6.0 SCOUR ASSESSMENT

Scour assessment has been performed for the proposed structure. Scour depths have been estimated following the procedures outlined in the latest April 2012 edition of HEC-18- Evaluating Scour at Bridges. As recommended in the Mass DOT LRFD Bridge Manual, the following amended local abutment scour equation was utilized:

$$Y_s/Y_a = [2.27 K_1 K_2 (L'/Y_a)0.43 Fr0.61] + 0.05$$

This equation predicts scour depths for the 50th percentile as compared to the more conservative HEC-18 version of Froehlich's equation (Equation 8.1, HEC-18, 2012), which would have encompassed 98% of the laboratory produced scour holes from the original study. The HEC-18 version of Froehlich's equation is as follows:

$$Y_s/Y_a = [2.27 K_1 K_2 (L'/Y_a)0.43 Fr0.61] + 1$$

In accordance with HEC-18, scour was evaluated for the following scour conditions:

- Long-term channel degradation and aggradation.
- Lateral contraction scour (HEC-18, Sections 6.1-6.4). Contraction scour is not applicable for pressure flow conditions and therefore contraction scour for 50-, 100- and 200-year events are excluded from the total scour estimate.
- Pressure flow scour also known as vertical contraction scour.
- Amended Froehlich's local abutment scour
- Total scour following procedures described in the National Cooperative Highway Research Program Report Estimation of Scour Depth at Bridge Abutments, NCHRP 24-20, 2010. It should not be used for live-bed or pressure flow conditions. Since conditions for this project are pressure flow for larger storm events, this method has not been used to estimate scour depths for the proposed bridge.

Scour Computations

Pressure flow (vertical contraction scour) during larger storm events is the primary component which causes scour at the proposed structure. Scour computations for the proposed crossing have been prepared for the 10-year discharge as well as the 25-year hydraulic design flow, 50-year scour design flow and 100-year scour check frequency. An estimate of D₅₀ is based on a soil grab sample of existing material taken at the site. Based on observed field conditions it appears that the present streambed is generally vertically stable and, as such, future long-term channel scour has been assumed to be negligible.

Mystic Street is classified as Rural Principal Arterial Street and therefore by guidelines in Mass DOT LRFD Bridge Manual, the scour design discharge is the 100-year frequency flood with the 200-year flow being the scour check discharge. Scour computations are included in Appendix F. Table 2 summarizes the results of the scour evaluations prepared for the project:

Table 2- Computed Proposed Bridge Scour		
Abutment	Estimated Total Scour Depth (feet)	Estimated Scour Elevation (feet, NAVD88)
<i>10 Year Discharge</i>		
Northerly	0	8.6
Southerly	0	8.6
<i>50 Year Discharge</i>		
Northerly	0.45	8.15
Southerly	0.83	7.77
<i>100 Year Discharge</i>		
Northerly	0.85	7.75
Southerly	1.56	7.04
<i>200 Year Discharge</i>		
Northerly	1.24	7.00
Southerly	2.04	6.20

Due to utility conflicts and constructability issues, it is not possible to provide conventional spread footings below the predicted scour depth. The proposed structure will be placed on micropiles. Existing abutments will be cut off at the top to the elevation shown on the plans. Riprap will be placed along the four corners of the bridge to prevent future erosion at the immediate banks and behind the existing abutments.

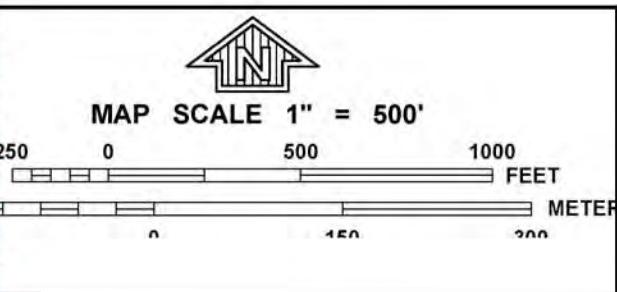
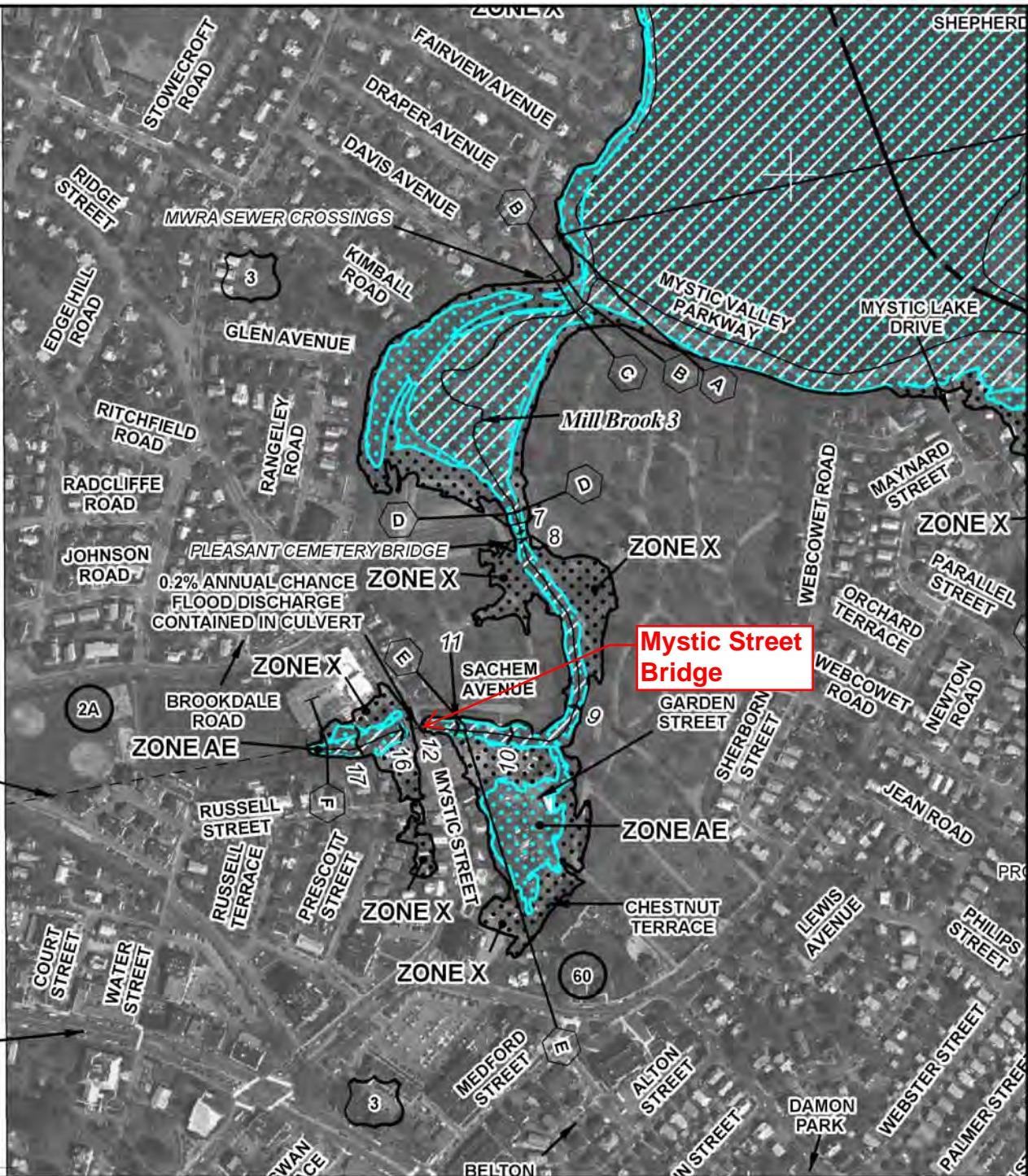
7.0 CONCLUSION

The proposed work detailed in this report has been designed in accordance with hydraulic standards and criteria prescribed in Massachusetts LRFD Bridge Design Manual. The proposed bridge design and construction faces tremendous challenges with possible conflicts from several utilities at the site. The proposed structure will be a scour resistant structure with significant improvements to the hydraulic conveying capacity.

APPENDIX A

Figures

JOINS PANEL 0410



PANEL 0417E

FIRM
FLOOD INSURANCE RATE MAP

**MIDDLESEX COUNTY,
MASSACHUSETTS
(ALL JURISDICTIONS)**

PANEL 417 OF 656
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
ARLINGTON, TOWN OF	250177	0417	E
MEDFORD, CITY OF	250205	0417	EE
SOMERVILLE, CITY OF	250214	0417	EE
WINCHESTER, TOWN OF	250228	0417	EE

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
25017C0417E

EFFECTIVE DATE
JUNE 4, 2010

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msfc.fema.gov



APPENDIX B

Hydrology Computations

StreamStats Version 3.0

Flow Statistics Ungaged Site Report

Date: Wed July 19, 2017 7:19:02 AM GMT-4

Study Area: Massachusetts

NAD 1983 Latitude: 42.4186 (42 25 07)

NAD 1983 Longitude: -71.1512 (-71 09 05)

Drainage Area: 5.05 mi²

Low Flows Basin Characteristics

100% Statewide Low Flow WRIR00 4135 (5.05 mi²)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	5.05	1.61	149
Mean Basin Slope from 250K DEM (percent)	3.242	0.32	24.6
Stratified Drift per Stream Length (square mile per mile)	0.17	0	1.29
Massachusetts Region (dimensionless)	0	0	1

Probability of Perennial Flow Basin Characteristics

100% Perennial Flow Probability (5.05 mi²)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	5.05 (above max value 1.99)	0.01	1.99
Percent Underlain By Sand And Gravel (percent)	41.03	0	100
Percent Forest (percent)	11.92	0	100
Massachusetts Region (dimensionless)	0	0	1

Warning: Some parameters are outside the suggested range. Estimates will be extrapolations with unknown errors.

Bankfull Flows Basin Characteristics

100% Bankfull Statewide SIR2013 5155 (5.05 mi²)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	5.05	0.6	329
Mean Basin Slope from 10m DEM (percent)	7.031	2.2	23.9

Peak Flow Regions Basin Characteristics

100% Peak Statewide 2016 5156 (5.05 mi²)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	5.05	0.16	512
Mean Basin Elevation (feet)	200	80.6	1948
Percent Storage from NLCD2006 (percent)	5.12	0	32.3

Low Flows Statistics

Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
D50	4.98	ft ³ /s	18		2.47	9.98
D60	3.56	ft ³ /s	20		1.77	7.11

D70	2.15	ft3/s	24		1.05	4.35
D75	1.66	ft3/s	26		0.81	3.37
D80	1.43	ft3/s	28		0.66	3.04
D85	1.07	ft3/s	32		0.47	2.37
D90	0.83	ft3/s	37		0.35	1.92
D95	0.49	ft3/s	46		0.18	1.27
D98	0.3	ft3/s	60		0.097	0.91
D99	0.22	ft3/s	65		0.067	0.71
M7D2Y	0.48	ft3/s	50		0.17	1.29
AUGD50	1.11	ft3/s	33		0.48	2.51
M7D10Y	0.21	ft3/s	71		0.0584	0.69

<http://pubs.usgs.gov/wri/wri004135/> (<http://pubs.usgs.gov/wri/wri004135/>)

Ries_K.G._ III_ 2000_ Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135_ 81 p.

Probability of Perennial Flow Statistics						
Statistic	Value	Unit	Standard Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
PROBPEREN	0.99	dim				

http://pubs.usgs.gov/sir/2006/5031/pdfs/SIR_2006-5031rev.pdf ([http://pubs.usgs.gov/sir/2006/5031rev.pdf](http://pubs.usgs.gov/sir/2006/5031/pdfs/SIR_2006-5031rev.pdf))

Bent_G.C._ and Steeves_P.A._ 2006_ A revised logistic regression equation and an automated procedure for mapping the probability of a stream flowing perennially in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2006-5031_ 107 p.

Bankfull Flows Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
BFWDTH	28.4	ft	21			
BFDPTH	1.51	ft	20			
BFAREA	42.6	ft ²	29			
BFFLOW	125	ft3/s	55			

<http://pubs.usgs.gov/sir/2013/5155/> (<http://pubs.usgs.gov/sir/2013/5155/>)

Bent_G.C._ and Waite_A.M._ 2013_ Equations for estimating bankfull channel geometry and discharge for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2013-5155_ 62 p._

Peak Flow Regions Statistics						
Statistic	Value	Unit	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
					Min	Max
PK2	149	ft3/s	42			
PK5	244	ft3/s	43			
PK10	318	ft3/s	45			
PK25	426	ft3/s	47			
PK50	516	ft3/s	49			
PK100	610	ft3/s	52			
PK200	713	ft3/s	54			
PK500	861	ft3/s	58			

<https://dx.doi.org/10.3133/sir20165156> (<https://dx.doi.org/10.3133/sir20165156>)

Zarriello_P.J._ 2017_ Magnitude of flood flows at selected annual exceedance probabilities for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2016-5156_ 99 p.

NETC Method

Project Site

Recurrence Interval (years)	Coefficient	Area (mi ²)	Area C	Annual Precip. (inches)	Precip. C	Design Flow (cfs)
2	0.01601	5.05	0.889	43.76	2.12	204
5	0.01965	5.05	0.889	43.76	2.19	325
10	0.02430	5.05	0.891	43.76	2.21	436
25	0.03387	5.05	0.893	43.76	2.20	586
50	0.04372	5.05	0.895	43.76	2.18	704
100	0.05765	5.05	0.897	43.76	2.15	832
200						1,001
500	0.11100	5.05	0.903	43.76	2.08	1,241

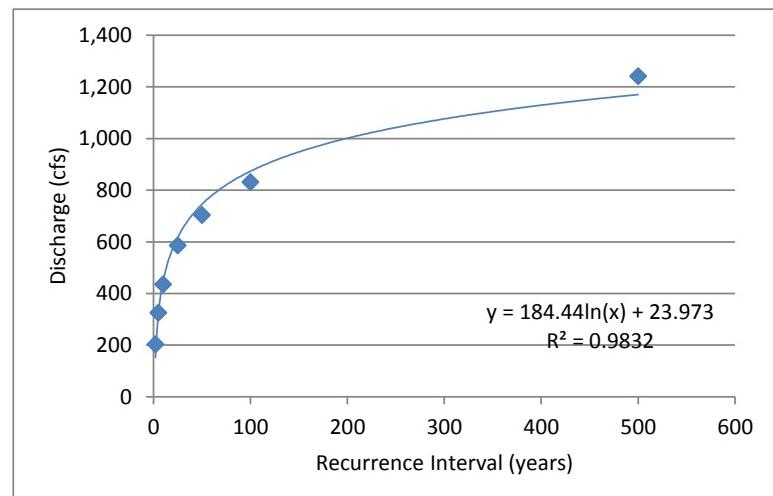


Table 2. Regression equations and their accuracy for estimating peak flows for steep, ungaged, unregulated drainage basins in New England. Steep is defined as a main channel slope that exceeds 50 ft per mile. [Q is peak flow, in cubic feet per second; A is drainage area, in square miles; P is mean annual precipitation in inches]

Peak-flow regression equation by recurrence interval	Standard Error of the Estimate (percent)	$(\text{PRESS}/n)^{1/2}$ (percent)		Average Prediction Error (percent)		Average Equivalent Yrs of Record
$Q_2=0.01601A^{0.889}P^{2.12}$	47.1%	-32.0%	46.9%	-31.9%	48.1%	-32.5%
$Q_5=0.01965A^{0.889}P^{2.19}$	45.1%	-31.1%	44.8%	-30.9%	46.1%	-31.6%
$Q_{10}=0.02430A^{0.891}P^{2.21}$	46.5%	-31.7%	46.4%	-31.7%	47.5%	-32.2%
$Q_{25}=0.03387A^{0.893}P^{2.20}$	50.4%	-33.5%	50.7%	-33.7%	51.5%	-34.0%
$Q_{50}=0.04372A^{0.895}P^{2.18}$	54.5%	-35.3%	55.2%	-30.9%	55.8%	-35.8%
$Q_{100}=0.05765A^{0.897}P^{2.15}$	59.4%	-37.3%	60.5%	-37.7%	60.8%	-37.8%
$Q_{500}=0.111A^{0.903}P^{2.08}$	73.4%	-42.3%	75.3%	-43.0%	75.1%	-42.9%

Flood Frequency Analysis Calculator: Log-Pearson Type III Distribution

USGS Gaging Station Name: Shawsheen River, Bedford

NOTE: Only enter data/edit yet

USGS Site ID: 01100568

Step 1: On separate sheet, sort PeakQ with date, from highest to lowest; Step 2: Paste sorted dates and Qpeak into Col B and

RANK	YEAR OF PEAK FLOW	PEAK_FLOW_ VALUE_Q(cfs)	LOGQ_cfs	YEAR OF	(log Q – avg(logQ))^2	(log Q – avg(logQ))^3	Return Period (n+1)/m	Probability (1/Tr) Exceedence
1	2011	1648	3.217	0.1082	0.0356	22.00	0.045	
2	1998	1622	3.210	0.1037	0.0334	11.00	0.091	
3	1999	1453	3.162	0.0752	0.0206	7.33	0.136	
4	2003	1266	3.102	0.0460	0.0099	5.50	0.182	
5	2014	1138	3.056	0.0283	0.0048	4.40	0.227	
6	2010	1017	3.007	0.0142	0.0017	3.67	0.273	
7	1997	884	2.946	0.0034	0.0002	3.14	0.318	
8	2005	882	2.945	0.0033	0.0002	2.75	0.364	
9	1996	865	2.937	0.0024	0.0001	2.44	0.409	
10	2001	839	2.924	0.0013	0.0000	2.20	0.455	
11	2015	782	2.893	0.0000	0.0000	2.00	0.500	
12	2013	773	2.888	0.0000	0.0000	1.83	0.545	
13	2012	747	2.873	0.0002	0.0000	1.69	0.591	
14	2002	723	2.859	0.0008	0.0000	1.57	0.636	
15	2008	645	2.810	0.0062	-0.0005	1.47	0.682	
16	2009	616	2.790	0.0097	-0.0010	1.38	0.727	
17	2007	588	2.769	0.0141	-0.0017	1.29	0.773	
18	2006	557	2.746	0.0202	-0.0029	1.22	0.818	
19	2004	427	2.630	0.0664	-0.0171	1.16	0.864	
20	2000	315	2.498	0.1519	-0.0592	1.10	0.909	
21	2016	242	2.384	0.2542	-0.1282	1.05	0.955	

Yellow cells; do not alter white or blue cells

and C, respectively

No. Years in Record	21.00					
Avg_Qpeak_cfs	858.52					
Avg_LogQ_cfs	2.888					
Sum {(log Q - avg(logQ))^2}	0.910					
Sum {(log Q - avg(logQ))^3}	-0.104					
Variance_LogQ_cfs	0.0455					
Stddev_LogQ_cfs	0.2133					
Skewness (Cs)	-0.5927					
Skew Coefficient (Cm)	0.70 **Determine from skew coefficient Map of US					
Variance of Regional Skewness V(Cm)	0.302 **Constant for U.S. = 0.302					
Variance of Station Skewness (V(Cs)):	0.29119 ** $V(\text{Cs})=10^{[A+B*(\log(n/10))]}$					
A value	-0.28259					
B value	0.78591					
Weighting Factor (W)	0.50911 ** $W=V(\text{Cm})/[V(\text{Cs})+V(\text{Cm})]$					
Weighted Skewness (Cw)	0.0419 ** $Cw = [W^*Cs] + [(1-W)^*Cm]$					
Table Cw upper	0.1 **Paste value here from K factor table below					
Table Cw lower	0 **Paste value here from K factor table below					
Calculated Cw Value	0.0419					
Tr	K lower	K upper	Slope	K calculated	LogQ _{Tr_cfs}	Q _{Tr_cfs}
2	0.000	-0.017	-0.17	-0.007	2.887	770.04
5	0.842	0.836	-0.06	0.839	3.067	1167
10	1.282	1.292	0.1	1.286	3.162	1453.2
25	1.751	1.785	0.34	1.765	3.264	1838.6
50	2.054	2.107	0.53	2.076	3.331	2142
100	2.326	2.400	0.74	2.357	3.391	2458.6
200	2.576	2.670	0.94	2.615	3.446	2791.3

*Note: paste K lower and upper values from K factor table below

Frequency Factors K for Gamma and log-Pearson Type III Distributions (Haan, 1977, Table 7.7)

WEIGHTED SKEW COEFFICIENT <i>Cw</i>	Recurrence Interval In Years								
	1.0101		2	5	10	25	50	100	200
	Percent Chance (\geq) = 1-F								
	99	50	20	10	4	2	1	0.5	
3	-0.667	-0.396	0.42	1.18	2.278	3.152	4.051	4.97	
2.9	-0.69	-0.39	0.44	1.195	2.277	3.134	4.013	4.904	
2.8	-0.714	-0.384	0.46	1.21	2.275	3.114	3.973	4.847	
2.7	-0.74	-0.376	0.479	1.224	2.272	3.093	3.932	4.783	
2.6	-0.769	-0.368	0.499	1.238	2.267	3.071	3.889	4.718	
2.5	-0.799	-0.36	0.518	1.25	2.262	3.048	3.845	4.652	
2.4	-0.832	-0.351	0.537	1.262	2.256	3.023	3.8	4.584	
2.3	-0.867	-0.341	0.555	1.274	2.248	2.997	3.753	4.515	
2.2	-0.905	-0.33	0.574	1.284	2.24	2.97	3.705	4.444	
2.1	-0.946	-0.319	0.592	1.294	2.23	2.942	3.656	4.372	
2	-0.99	-0.307	0.609	1.302	2.219	2.912	3.605	4.298	
1.9	-1.037	-0.294	0.627	1.31	2.207	2.881	3.553	4.223	
1.8	-1.087	-0.282	0.643	1.318	2.193	2.848	3.499	4.147	
1.7	-1.14	-0.268	0.66	1.324	2.179	2.815	3.444	4.069	
1.6	-1.197	-0.254	0.675	1.329	2.163	2.78	3.388	3.99	
1.5	-1.256	-0.24	0.69	1.333	2.146	2.743	3.33	3.91	
1.4	-1.318	-0.225	0.705	1.337	2.128	2.706	3.271	3.828	
1.3	-1.383	-0.21	0.719	1.339	2.108	2.666	3.211	3.745	
1.2	-1.449	-0.195	0.732	1.34	2.087	2.626	3.149	3.661	
1.1	-1.518	-0.18	0.745	1.341	2.066	2.585	3.087	3.575	
1	-1.588	-0.164	0.758	1.34	2.043	2.542	3.022	3.489	
0.9	-1.66	-0.148	0.769	1.339	2.018	2.498	2.957	3.401	
0.8	-1.733	-0.132	0.78	1.336	1.993	2.453	2.891	3.312	
0.7	-1.806	-0.116	0.79	1.333	1.967	2.407	2.824	3.223	
0.6	-1.88	-0.099	0.8	1.328	1.939	2.359	2.755	3.132	
0.5	-1.955	-0.083	0.808	1.323	1.91	2.311	2.686	3.041	
0.4	-2.029	-0.066	0.816	1.317	1.88	2.261	2.615	2.949	
0.3	-2.104	-0.05	0.824	1.309	1.849	2.211	2.544	2.856	
0.2	-2.178	-0.033	0.83	1.301	1.818	2.159	2.472	2.763	
0.1	-2.252	-0.017	0.836	1.292	1.785	2.107	2.4	2.67	
0	-2.326	0	0.842	1.282	1.751	2.054	2.326	2.576	
-0.1	-2.4	0.017	0.846	1.27	1.716	2	2.252	2.482	
-0.2	-2.472	0.033	0.85	1.258	1.68	1.945	2.178	2.388	
-0.3	-2.544	0.05	0.853	1.245	1.643	1.89	2.104	2.294	
-0.4	-2.615	0.066	0.855	1.231	1.606	1.834	2.029	2.201	
-0.5	-2.686	0.083	0.856	1.216	1.567	1.777	1.955	2.108	
-0.6	-2.755	0.099	0.857	1.2	1.528	1.72	1.88	2.016	
-0.7	-2.824	0.116	0.857	1.183	1.488	1.663	1.806	1.926	
-0.8	-2.891	0.132	0.856	1.166	1.448	1.606	1.733	1.837	
-0.9	-2.957	0.148	0.854	1.147	1.407	1.549	1.66	1.749	
-1	-3.022	0.164	0.852	1.128	1.366	1.492	1.588	1.664	
-1.1	-3.087	0.18	0.848	1.107	1.324	1.435	1.518	1.581	
-1.2	-3.149	0.195	0.844	1.086	1.282	1.379	1.449	1.501	
-1.3	-3.211	0.21	0.838	1.064	1.24	1.324	1.383	1.424	
-1.4	-3.271	0.225	0.832	1.041	1.198	1.27	1.318	1.351	
-1.5	-3.33	0.24	0.825	1.018	1.157	1.217	1.256	1.282	
-1.6	-3.388	0.254	0.817	0.994	1.116	1.166	1.197	1.216	
-1.7	-3.444	0.268	0.808	0.97	1.075	1.116	1.14	1.155	
-1.8	-3.499	0.282	0.799	0.945	1.035	1.069	1.087	1.097	
-1.9	-3.553	0.294	0.788	0.92	0.996	1.023	1.037	1.044	
-2	-3.605	0.307	0.777	0.895	0.959	0.98	0.99	0.995	
-2.1	-3.656	0.319	0.765	0.869	0.923	0.939	0.946	0.949	
-2.2	-3.705	0.33	0.752	0.844	0.888	0.9	0.905	0.907	
-2.3	-3.753	0.341	0.739	0.819	0.855	0.864	0.867	0.869	
-2.4	-3.8	0.351	0.725	0.795	0.823	0.83	0.832	0.833	
-2.5	-3.845	0.36	0.711	0.711	0.793	0.798	0.799	0.8	
-2.6	-3.899	0.368	0.696	0.747	0.764	0.768	0.769	0.769	
-2.7	-3.932	0.376	0.681	0.724	0.738	0.74	0.74	0.741	
-2.8	-3.973	0.384	0.666	0.702	0.712	0.714	0.714	0.714	
-2.9	-4.013	0.39	0.651	0.681	0.683	0.689	0.69	0.69	
-3	-4.051	0.396	0.636	0.66	0.666	0.666	0.667	0.667	

Flood Frequency Analysis Calculator: Log-Pearson Type III Distribution

USGS Gaging Station Name:

Old Swamp, S. Weymouth

NOTE: Only enter data/edit yes.

USGS Site ID: 01105600

Step 1: On separate sheet, sort PeakQ with date, from highest to lowest; Step 2: Paste sorted dates and Qpeak into Col B and

RANK	YEAR OF PEAK FLOW	PEAK_FLOW_ VALUE_Q(cfs)	LOGQ_cfs	(log Q – avg(logQ))^2	(log Q – avg(logQ))^3	Return Period (n+1)/m	Probability (1/Tr) Exceedence
1	1984	662	2.821	0.2592	0.1319	51.00	0.020
2	1968	635	2.803	0.2411	0.1184	25.50	0.039
3	1970	527	2.722	0.1681	0.0689	17.00	0.059
4	1982	525	2.720	0.1668	0.0681	12.75	0.078
5	2006	514	2.711	0.1593	0.0636	10.20	0.098
6	2005	451	2.654	0.1172	0.0401	8.50	0.118
7	2010	448	2.651	0.1153	0.0391	7.29	0.137
8	1978	402	2.604	0.0855	0.0250	6.38	0.157
9	1994	376	2.575	0.0694	0.0183	5.67	0.176
10	1983	362	2.559	0.0610	0.0151	5.10	0.196
11	1969	342	2.534	0.0494	0.0110	4.64	0.216
12	1996	341	2.533	0.0488	0.0108	4.25	0.235
13	1997	340	2.531	0.0483	0.0106	3.92	0.255
14	1974	337	2.528	0.0466	0.0101	3.64	0.275
15	2001	325	2.512	0.0400	0.0080	3.40	0.294
16	1993	321	2.507	0.0379	0.0074	3.19	0.314
17	1976	257	2.410	0.0096	0.0009	3.00	0.333
18	2008	254	2.405	0.0087	0.0008	2.83	0.353
19	1998	251	2.400	0.0077	0.0007	2.68	0.373
20	1967	232	2.365	0.0029	0.0002	2.55	0.392
21	2009	221	2.344	0.0011	0.0000	2.43	0.412
22	2007	217	2.336	0.0006	0.0000	2.32	0.431
23	1995	200	2.301	0.0001	0.0000	2.22	0.451
24	1979	196	2.292	0.0004	0.0000	2.13	0.471
25	1999	192	2.283	0.0008	0.0000	2.04	0.490
26	2004	192	2.283	0.0008	0.0000	1.96	0.510
27	2012	184	2.265	0.0022	-0.0001	1.89	0.529
28	1992	176	2.246	0.0044	-0.0003	1.82	0.549
29	2015	172	2.236	0.0058	-0.0004	1.76	0.569
30	1987	168	2.225	0.0075	-0.0006	1.70	0.588
31	2013	164	2.215	0.0094	-0.0009	1.65	0.608
32	1981	162	2.210	0.0105	-0.0011	1.59	0.627
33	1972	154	2.188	0.0154	-0.0019	1.55	0.647
34	2000	149	2.173	0.0192	-0.0027	1.50	0.667
35	1977	146	2.164	0.0217	-0.0032	1.46	0.686
36	1991	143	2.155	0.0245	-0.0038	1.42	0.706
37	2003	143	2.155	0.0245	-0.0038	1.38	0.725
38	1988	132	2.121	0.0366	-0.0070	1.34	0.745
39	1990	130	2.114	0.0391	-0.0077	1.31	0.765
40	1973	125	2.097	0.0462	-0.0099	1.28	0.784
41	2014	119	2.076	0.0558	-0.0132	1.24	0.804
42	1971	116	2.064	0.0612	-0.0151	1.21	0.824
43	2016	105	2.021	0.0844	-0.0245	1.19	0.843
44	1980	104	2.017	0.0869	-0.0256	1.16	0.863
45	1986	100	2.000	0.0972	-0.0303	1.13	0.882
46	2011	95	1.978	0.1116	-0.0373	1.11	0.902
47	2002	93	1.968	0.1179	-0.0405	1.09	0.922
48	1975	91	1.959	0.1244	-0.0439	1.06	0.941
49	1989	84	1.924	0.1502	-0.0582	1.04	0.961
50	1985	43	1.633	0.4601	-0.3121	1.02	0.980

allow cells; do not alter white or blue cells

and C, respectively

No. Years in Record	50.00					
Avg_Qpeak_cfs	244.36					
Avg_LogQ_cfs	2.312					
Sum {(log Q - avg(logQ))^2}	3.363					
Sum {(log Q - avg(logQ))^3}	0.005					
Variance_LogQ_cfs	0.0686					
Stdev_LogQ_cfs	0.2620					
Skewness (Cs)	0.0056					
Skew Coefficient (Cm)	0.70 **Determine from skew coefficient Map of US					
Variance of Regional Skewness V(Cm)	0.302 **Constant for U.S. = 0.302					
Variance of Station Skewness (V(Cs))	0.10338 ** $V(Cs)=10^{[A-B*(\log(n/10))]}$					
A value	-0.32955					
B value	0.93854					
Weighting Factor (W)	0.74498 ** $W=V(Cm)/[V(Cs)+V(Cm)]$					
Weighted Skewness (Cw)	0.1827 ** $Cw = [W*Cs] + [(1-W)*Cm]$					
Table Cw upper	0.2 **Paste value here from K factor table below					
Table Cw lower	0.1 **Paste value here from K factor table below					
Calculated Cw Value	0.1827					
Tr	K lower	K upper	Slope	K calculated	LogQ _{Tr_cfs}	Q _{Tr_cfs}
2	-0.017	-0.033	-0.16	-0.030	2.304	201.31
5	0.836	0.830	-0.06	0.831	2.529	338.45
10	1.292	1.301	0.09	1.299	2.652	448.97
25	1.785	1.818	0.33	1.812	2.787	611.75
50	2.107	2.159	0.52	2.150	2.875	749.98
100	2.400	2.472	0.72	2.460	2.956	903.94
200	2.670	2.763	0.93	2.747	3.031	1075

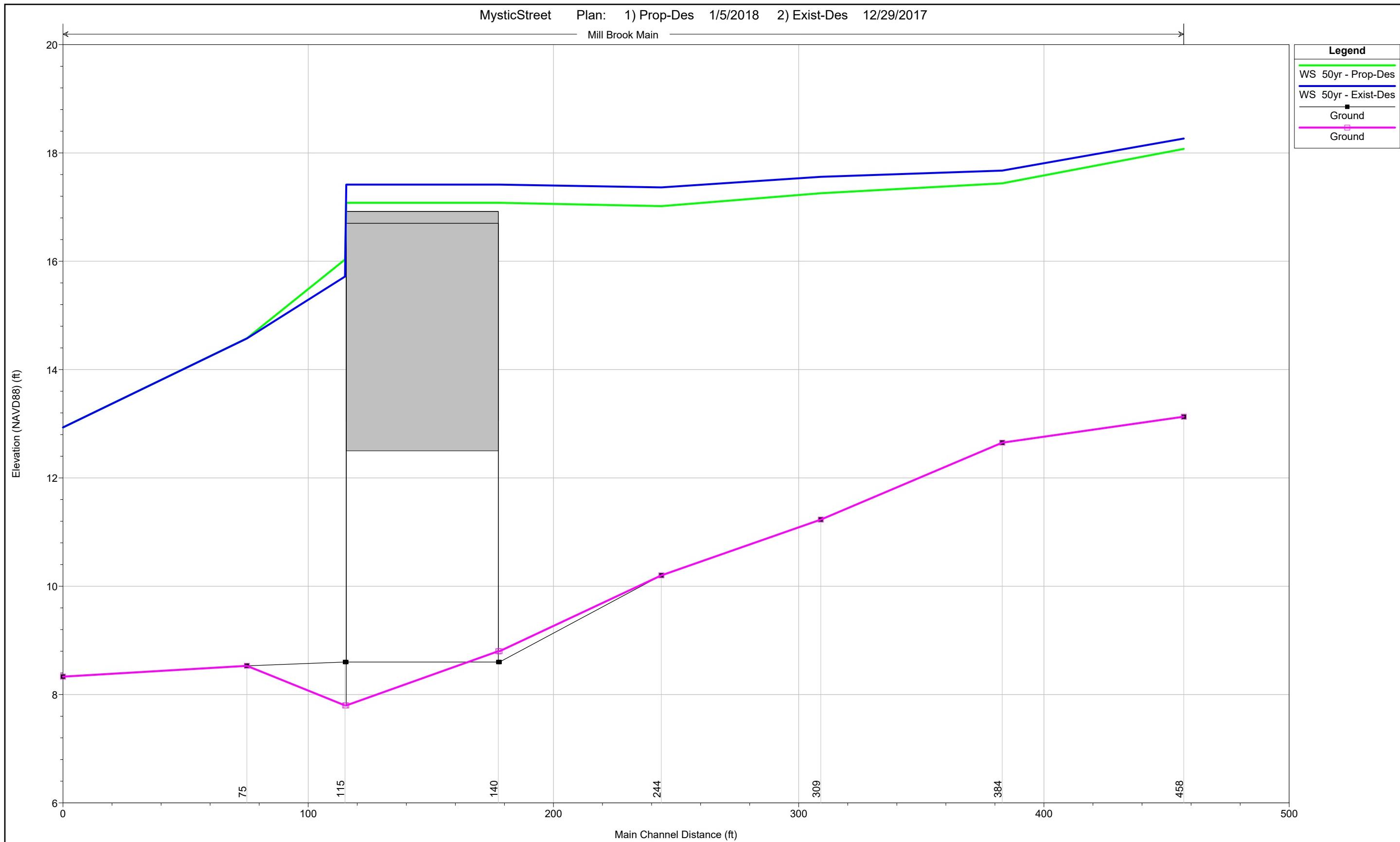
*Note: paste K lower and upper values from K factor table below

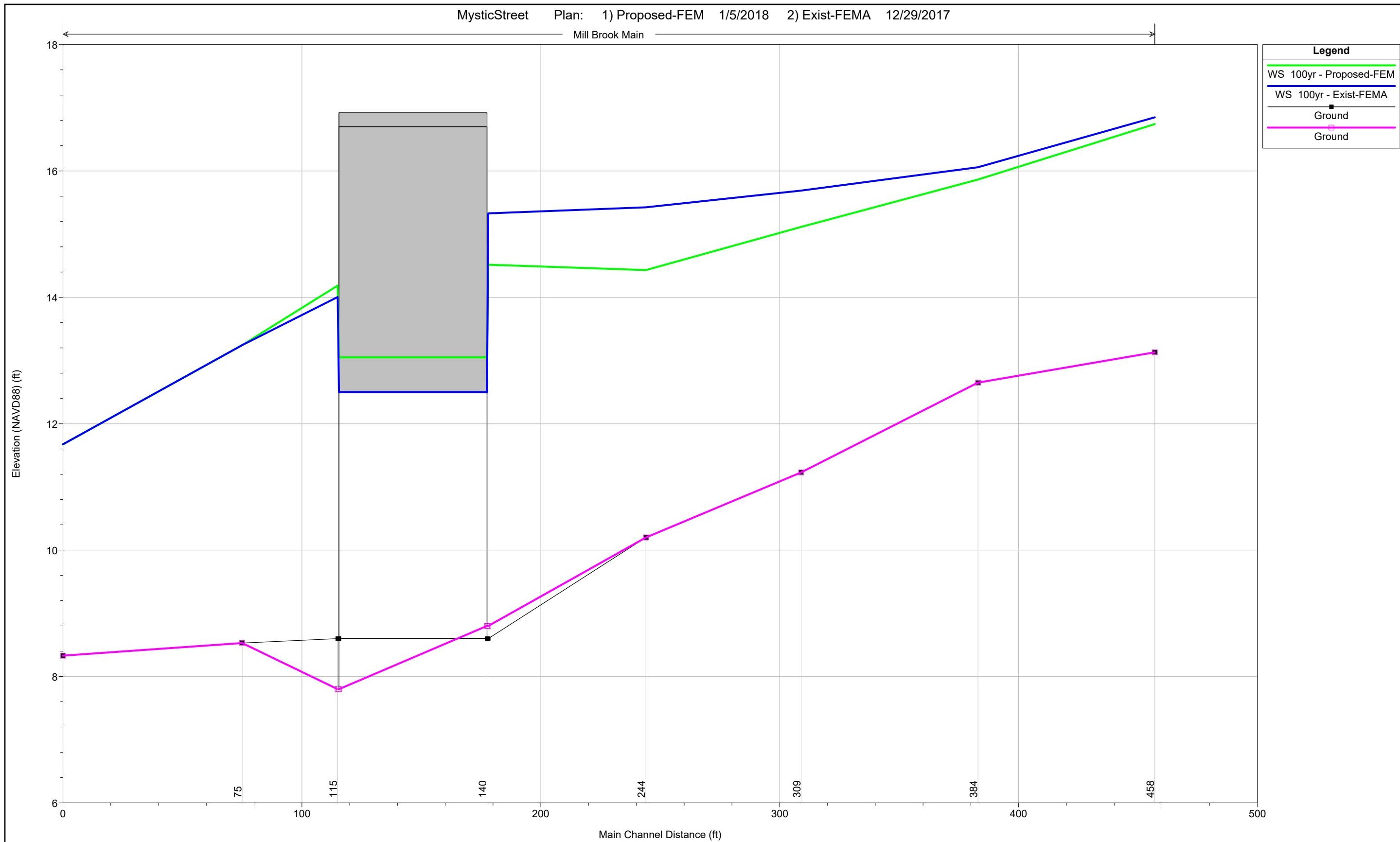
Frequency Factors K for Gamma and log-Pearson Type III Distributions (Haan, 1977, Table 7.7)

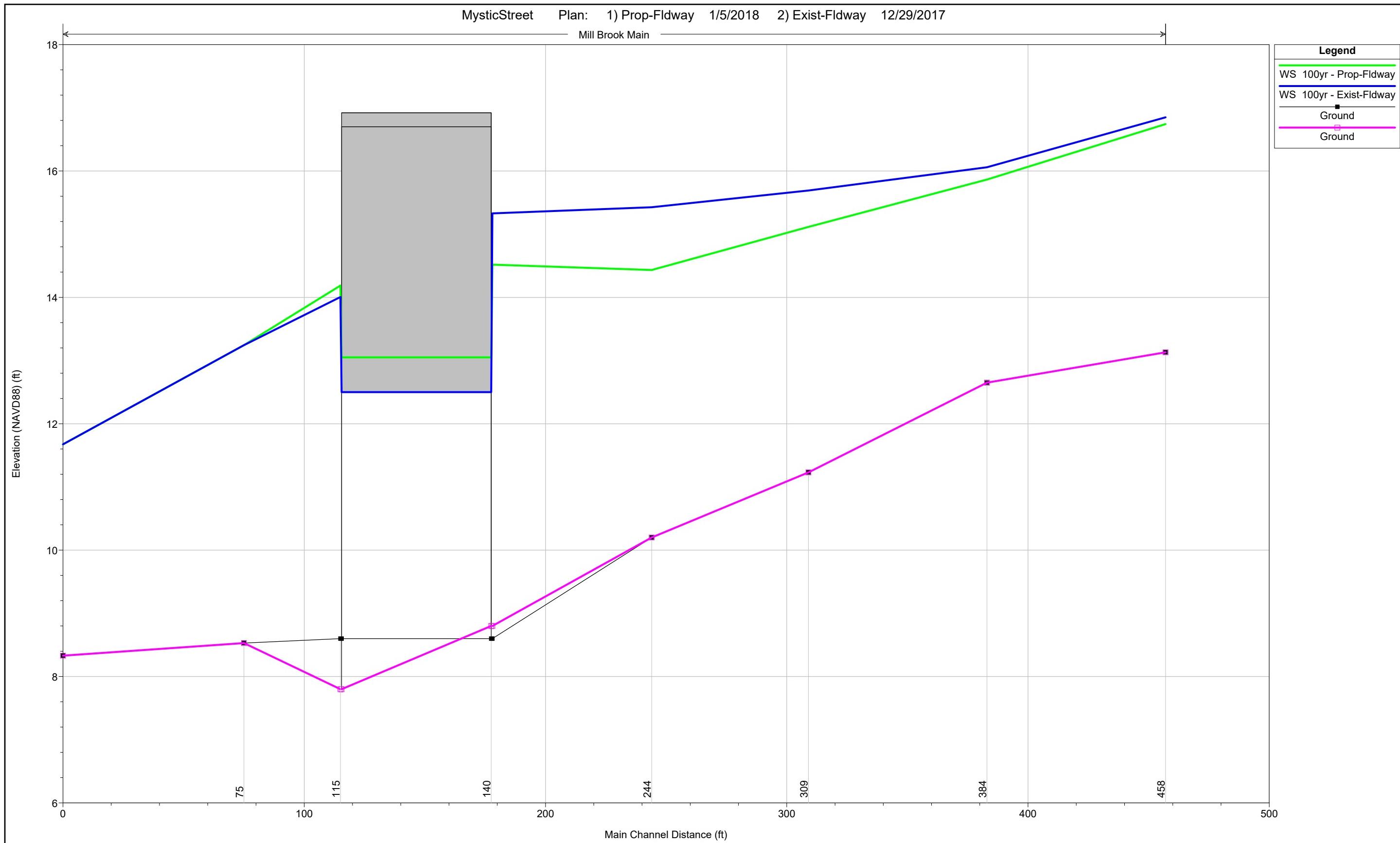
WEIGHTED SKEW COEFFICIENT Cw	Recurrence Interval In Years								
	1.0101		2	5	10	25	50	100	200
	Percent Chance (\geq) = 1-F	99	50	20	10	4	2	1	0.5
3	-0.667	-0.396	0.42		1.18	2.278	3.152	4.051	4.97
2.9	-0.69	-0.39	0.44		1.195	2.277	3.134	4.013	4.904
2.8	-0.714	-0.384	0.46		1.21	2.275	3.114	3.973	4.847
2.7	-0.74	-0.376	0.479		1.224	2.272	3.093	3.932	4.783
2.6	-0.769	-0.368	0.499		1.238	2.267	3.071	3.889	4.718
2.5	-0.799	-0.36	0.518		1.25	2.262	3.048	3.845	4.652
2.4	-0.832	-0.351	0.537		1.262	2.256	3.023	3.8	4.584
2.3	-0.867	-0.341	0.555		1.274	2.248	2.997	3.753	4.515
2.2	-0.905	-0.33	0.574		1.284	2.24	2.97	3.705	4.444
2.1	-0.946	-0.319	0.592		1.294	2.23	2.942	3.656	4.372
2	-0.99	-0.307	0.609		1.302	2.219	2.912	3.605	4.298
1.9	-1.037	-0.294	0.627		1.31	2.207	2.881	3.553	4.223
1.8	-1.087	-0.282	0.643		1.318	2.193	2.848	3.499	4.147
1.7	-1.14	-0.268	0.66		1.324	2.179	2.815	3.444	4.069
1.6	-1.197	-0.254	0.675		1.329	2.163	2.78	3.388	3.99
1.5	-1.256	-0.24	0.69		1.333	2.146	2.743	3.33	3.91
1.4	-1.318	-0.225	0.705		1.337	2.128	2.706	3.271	3.828
1.3	-1.383	-0.21	0.719		1.339	2.108	2.666	3.211	3.745
1.2	-1.449	-0.195	0.732		1.34	2.087	2.626	3.149	3.661
1.1	-1.518	-0.18	0.745		1.341	2.066	2.585	3.087	3.575
1	-1.588	-0.164	0.758		1.34	2.043	2.542	3.022	3.489
0.9	-1.66	-0.148	0.769		1.339	2.018	2.498	2.957	3.401
0.8	-1.733	-0.132	0.78		1.336	1.993	2.453	2.891	3.312
0.7	-1.806	-0.116	0.79		1.333	1.967	2.407	2.824	3.223
0.6	-1.88	-0.099	0.8		1.328	1.939	2.359	2.755	3.132
0.5	-1.955	-0.083	0.808		1.323	1.91	2.311	2.686	3.041
0.4	-2.029	-0.066	0.816		1.317	1.88	2.261	2.615	2.949
0.3	-2.104	-0.05	0.824		1.309	1.849	2.211	2.544	2.856
0.2	-2.178	-0.033	0.83		1.301	1.818	2.159	2.472	2.763
0.1	-2.252	-0.017	0.836		1.292	1.785	2.107	2.4	2.67
0	-2.326	0	0.842		1.282	1.751	2.054	2.326	2.576
-0.1	-2.4	0.017	0.846		1.27	1.716	2	2.252	2.482
-0.2	-2.472	0.033	0.85		1.258	1.68	1.945	2.178	2.388
-0.3	-2.544	0.05	0.853		1.245	1.643	1.89	2.104	2.294
-0.4	-2.615	0.066	0.855		1.231	1.606	1.834	2.029	2.201
-0.5	-2.686	0.083	0.856		1.216	1.567	1.777	1.955	2.108
-0.6	-2.755	0.099	0.857		1.2	1.528	1.72	1.88	2.016
-0.7	-2.824	0.116	0.857		1.183	1.488	1.663	1.806	1.926
-0.8	-2.891	0.132	0.856		1.166	1.448	1.606	1.733	1.837
-0.9	-2.957	0.148	0.854		1.147	1.407	1.549	1.66	1.749
-1	-3.022	0.164	0.852		1.128	1.366	1.492	1.588	1.664
-1.1	-3.087	0.18	0.848		1.107	1.324	1.435	1.518	1.581
-1.2	-3.149	0.195	0.844		1.086	1.282	1.379	1.449	1.501
-1.3	-3.211	0.21	0.838		1.064	1.24	1.324	1.383	1.424
-1.4	-3.271	0.225	0.832		1.041	1.198	1.27	1.318	1.351
-1.5	-3.33	0.24	0.825		1.018	1.157	1.217	1.256	1.282
-1.6	-3.388	0.254	0.817		0.994	1.116	1.166	1.197	1.216
-1.7	-3.444	0.268	0.808		0.97	1.075	1.116	1.14	1.155
-1.8	-3.499	0.282	0.799		0.945	1.035	1.069	1.087	1.097
-1.9	-3.553	0.294	0.788		0.92	0.996	1.023	1.037	1.044
-2	-3.605	0.307	0.777		0.895	0.959	0.98	0.99	0.995
-2.1	-3.656	0.319	0.765		0.869	0.923	0.939	0.946	0.949
-2.2	-3.705	0.33	0.752		0.844	0.888	0.9	0.905	0.907
-2.3	-3.753	0.341	0.739		0.819	0.855	0.864	0.867	0.869
-2.4	-3.8	0.351	0.725		0.795	0.823	0.83	0.832	0.833
-2.5	-3.845	0.36	0.711		0.711	0.793	0.798	0.799	0.8
-2.6	-3.899	0.368	0.696		0.747	0.764	0.768	0.769	0.769
-2.7	-3.932	0.376	0.681		0.724	0.738	0.74	0.74	0.741
-2.8	-3.973	0.384	0.666		0.702	0.712	0.714	0.714	0.714
-2.9	-4.013	0.39	0.651		0.681	0.683	0.689	0.69	0.69
-3	-4.051	0.396	0.636		0.66	0.666	0.666	0.667	0.667

APPENDIX C

HEC-RAS Profiles







APPENDIX D

Existing Conditions

Existing Conditions -Design Flows

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

X	X	XXXXXX	XXXX	XXXX	XX	XXXX
X	X	X	X X	X X	X X	X
X	X	X	X	X X	X X	X
XXXXXX	XXXX	X	XXX	XXXX	XXXXXX	XXXX
X	X	X	X	X X	X X	X
X	X	X	X X	X X	X X	X
X	X	XXXXXX	XXXX	X X	X X	XXXXX

PROJECT DATA

Project Title: MysticStreet
Project File : MysticStreet.prj
Run Date and Time: 12/29/2017 12:59:16 PM

Project in English units

Project Description:

Project: Mystic Street Bridge Replacement in Arlington, MA
Done by: LEC and
RSV
Datum: NAVD88

PLAN DATA

Plan Title: Existing-Design
Plan File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.p01

Geometry Title: Existing
Geometry File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.g01

Flow Title : Design Flows
Flow File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.f03

Plan Description:

Existing conditions with Design Flows.

Plan Summary Information:

Number of: Cross Sections =	8	Multiple Openings =	0
Culverts =	0	Inline Structures =	0
Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3

Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary

Conveyance Calculation Method: At breaks in n values only

Friction Slope Method: Average Conveyance

Computational Flow Regime: Mixed Flow

FLOW DATA

Flow Title: Design Flows

Flow File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.f03

Flow Data (cfs)

River	Reach	RS	2yr	5yr	500yr
10yr	25yr	50yr	100yr	200yr	338
Mill Brook	Main	458		201	
449	612	750	904	1075	1207

River	Reach	RS	PF 9
Mill Brook	Main	458	570

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
Mill Brook	Main	2yr	Normal S = 0.063
Rating Curve #1			
Mill Brook	Main	5yr	Normal S = 0.063
Known WS = 10.6			
Mill Brook	Main	10yr	Normal S = 0.063
Known WS = 10.8			
Mill Brook	Main	25yr	Normal S = 0.063
Known WS = 11.9			
Mill Brook	Main	50yr	Normal S = 0.063
Known WS = 11.9			
Mill Brook	Main	100yr	Normal S = 0.063
Known WS = 11.9			
Mill Brook	Main	200yr	Normal S = 0.063
Known WS = 11.9			
Mill Brook	Main	500yr	Normal S = 0.063
Known WS = 11.9			

Rating Curve #1

Flow (cfs)	Elev (ft)
150	10
310	10.6
450	10.8
730	11.9

GEOOMETRY DATA

Geometry Title: Existing
Geometry File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.g01

CROSS SECTION

RIVER: Mill Brook
REACH: Main RS: 458

INPUT

Description: Upstream end of study area (FEMA Cross Section F)

Station Elevation Data num= 8
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
-73.7 26 -32.7 24.59 -21.7 19.45 -11.2 14.3 -9.3 13.4
0 13.13 14.3 14.37 32.8 24.27

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
-73.7 .06 -11.2 .045 14.3 .07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-11.2 14.3 77 74 70 .1 .3

CROSS SECTION

RIVER: Mill Brook
REACH: Main RS: 384

INPUT

Description: 204 FT upstream of Mysitc St. Bridge

Station Elevation Data num= 8
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
-121.1 26 -41.1 24.5 -16.1 17.3 -10.2 13.7 -8.5 12.65
0 12.71 10.9 13.72 24.3 21.76

Manning's n Values num= 3
Sta n Val Sta n Val Sta n Val
-121.1 .06 -10.2 .045 10.9 .07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-10.2 10.9 67 74 78 .1 .3

CROSS SECTION

RIVER: Mill Brook
REACH: Main RS: 309

INPUT

Description: 130 ft Upstream of Bridge

Station Elevation Data num= 13
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
-135 26 -85 24.5 -34 17.3 -16.4 15.82 -14.5 14.8
-13 14 -9.1 12.01 0 11.23 7.4 12.81 12.3 14
15.6 14.8 15.61 17.11 125 19

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val							
-135	.06	-9.1	.045	7.4	.06							
Bank Sta: Left Right		Lengths: Left Channel		Right		Coeff	Contr.	Expan.				
-13	12.3		66	65	65		.1	.3				

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 244

INPUT

Description: 65 Upstream of Mystic Bridge

Station	Elevation	Data	num=	10								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
-115	26	-63	22	-45	18	-33	17.5	-17.5	17.02			
-10.1	12.22	0	10.2	12.2	12.44	12.3	17.62	166	19			

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val					
-115	.06	-10.1	.045	12.2	.02	12.3	.06					

Bank Sta: Left Right		Lengths: Left Channel		Right		Coeff	Contr.	Expan.				
-17.5	12.3		66	66	66		.1	.3				

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 179

INPUT

Description: Upstream face of Mystic Street Bridge

Station	Elevation	Data	num=	20								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
-186	20	-141	19	-80	17.18	-50	16.8	-22	16			
-15.7	15	-13	12.76	-8.61	12.76	-8.6	9	-4.85	8.9			
-1	9.6	0	9.2	1	9.2	4.3	9	13.6	8.8			
13.61	12.5	13.62	16.48	65.6	16.5	230	17.55	390	19			

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val			
-186	.06	-8.61	.02	-8.6	.045	13.6	.02	13.61	.06			

Bank Sta: Left Right		Lengths: Left Channel		Right		Coeff	Contr.	Expan.				
-8.61	13.61		63	63	66		.3	.5				

Ineffective Flow	num=	2										
Sta L	Sta R	Elev	Permanent									
-186	-8.61	16.7	F									
9.6	390	16.7	F									

BRIDGE

RIVER: Mill Brook

REACH: Main RS: 140

INPUT

Description: Mystic St. Bridge

Distance from Upstream XS = .5

Deck/Roadway Width = 62

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 12

	Sta	Hi	Cord	Lo	Cord		Sta	Hi	Cord	Lo	Cord		Sta	Hi	Cord	Lo	Cord
-107	17.5		0	-50	16.85	0	-9	16.7		0			-8.6	19.65	12.5		
-9	19.65		0	-8.6	19.65	0	-8.6		19.65	12.5							
0	19.65		12.5	9.6	19.65	12.5	9.6	16.7		0			9.6	16.7			
94	17.1		0	230	17.9		390		19.4								

Upstream Bridge Cross Section Data

Station Elevation Data num= 20

	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-186	20	-141	19	-80	17.18	-50	16.8	-22	16	
-15.7	15	-13	12.76	-8.61	12.76	-8.6	9	-4.85	8.9	
-1	9.6	0	9.2	1	9.2	4.3	9	13.6	8.8	
13.61	12.5	13.62	16.48	65.6	16.5	230	17.55	390	19	

Manning's n Values

num= 5

	Sta	n Val								
--	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------

-186	.06	-8.61	.02	-8.6	.045	13.6	.02	13.61	.06
------	-----	-------	-----	------	------	------	-----	-------	-----

Bank Sta: Left Right Coeff Contr. Expan.

-8.61	13.61	.3	.5
-------	-------	----	----

Ineffective Flow num= 2

	Sta L	Sta R	Elev	Permanent
--	-------	-------	------	-----------

-186	-8.61	16.7	F
9.6	390	16.7	F

Downstream Deck/Roadway Coordinates

num= 12

	Sta	Hi	Cord	Lo	Cord		Sta	Hi	Cord	Lo	Cord	
-107	17.5		0	-50	16.85	0	-9	16.7		0		
-9	19.65		0	-8.6	19.65	0	-8.6	19.65	12.5			
0	19.65		12.5	9.6	19.65	12.5	9.6	16.7		0		
94	17.1		0	230	17.9		390		19.4			

Downstream Bridge Cross Section Data

Station Elevation Data num= 19

	Sta	Elev								
--	-----	------	-----	------	-----	------	-----	------	-----	------

-214	20	-173	19	-114.5	18	-64.5	17	-35	16
-8.61	15.7	-8.6	7.8	-3.8	8.2	-1	8.3	0	8
1	8.7	5.9	8.7	8.8	8.9	17.1	13	23.5	16.25
41.5	16.7	91.5	17	204	17.16	340	19		

Manning's n Values

num= 5

	Sta	n Val								
--	-----	-------	-----	-------	-----	-------	-----	-------	-----	-------

-214	.06	-8.61	.02	-8.6	.04	17.1	.07	41.5	.05
------	-----	-------	-----	------	-----	------	-----	------	-----

Bank Sta: Left Right Coeff Contr. Expan.

-8.61	17.1	.3	.5
-------	------	----	----

Ineffective Flow num= 2

	Sta L	Sta R	Elev	Permanent
--	-------	-------	------	-----------

-214	-8.6	16.7	F
9.6	340	16.7	F

Upstream Embankment side slope

= 0 horiz. to 1.0 vertical

Downstream Embankment side slope

= 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98

Elevation at which weir flow begins = 16.7

Energy head used in spillway design =

Spillway height used in design =

Weir crest shape = Broad Crested

Number of Piers = 1

Pier Data
Pier Station Upstream= 0 Downstream= 0
Upstream num= 2
Width Elev Width Elev
2 7 2 12.8
Downstream num= 2
Width Elev Width Elev
2 7 2 12.8

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Pressure and Weir flow
Submerged Inlet Cd =
Submerged Inlet + Outlet Cd = .8
Max Low Cord = 12.5

Additional Bridge Parameters

Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 115

INPUT

Description: Downstream face of Mystic Street Bridge

Station Elevation Data num= 19
Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
-214 20 -173 19 -114.5 18 -64.5 17 -35 16
-8.61 15.7 -8.6 7.8 -3.8 8.2 -1 8.3 0 8
1 8.7 5.9 8.7 8.8 8.9 17.1 13 23.5 16.25
41.5 16.7 91.5 17 204 17.16 340 19

Manning's n Values num= 5
Sta n Val Sta n Val Sta n Val Sta n Val Sta n Val
-214 .06 -8.61 .02 -8.6 .04 17.1 .07 41.5 .05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-8.61 17.1 45 40 30 .3 .5

Ineffective Flow num= 2
Sta L Sta R Elev Permanent
-214 -8.6 16.7 F
9.6 340 16.7 F

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 75

INPUT

Description: 40 Downstream of Mystic St. Bridge

Station Elevation Data num=				9							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-5.31	20	-5.3	11	-5.3	8.97	0	8.53	6.7	8.76		
8.8	11	13	15.27	30	16	30	20				

Manning's n Values num=				4							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val				
-5.31	.02	-5.3	.04	8.8	.07	13	.05				

Bank Sta: Left Right		Lengths: Left Channel		Right		Coeff Contr.	Expan.
-5.3	8.8	75	75	74		.1	.3

CROSS SECTION

RIVER: Mill Brook
REACH: Main RS: 0

INPUT
Description: Downstream End of Model (FEMA Cross-Section E)

Station Elevation Data num=				9							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-6.1	20	-6	10	-6	8.33	0	8.44	7	8.71		
8.6	10	13.3	13.78	21.4	14	21.4	22.5				

Manning's n Values num=				4							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val				
-6.1	.02	-6	.04	8.6	.07	13.3	.05				

Bank Sta: Left Right		Lengths: Left Channel		Right		Coeff Contr.	Expan.
-6	8.6	0	0	0		.1	.3

SUMMARY OF MANNING'S N VALUES

River: Mill Brook

Reach	River Sta.	n1	n2	n3	n4	n5
Main	458	.06	.045	.07		
Main	384	.06	.045	.07		
Main	309	.06	.045	.06		
Main	244	.06	.045	.02	.06	
Main	179	.06	.02	.045	.02	.06
Main	140	Bridge				
Main	115	.06	.02	.04	.07	.05
Main	75	.02	.04	.07	.05	
Main	0	.02	.04	.07	.05	

SUMMARY OF REACH LENGTHS

River: Mill Brook

Reach	River Sta.	Left	Channel	Right
Main	458	77	74	70
Main	384	67	74	78
Main	309	66	65	65
Main	244	66	66	66

Main	179		63	63	66
Main	140	Bridge			
Main	115		45	40	30
Main	75		75	75	74
Main	0		0	0	0

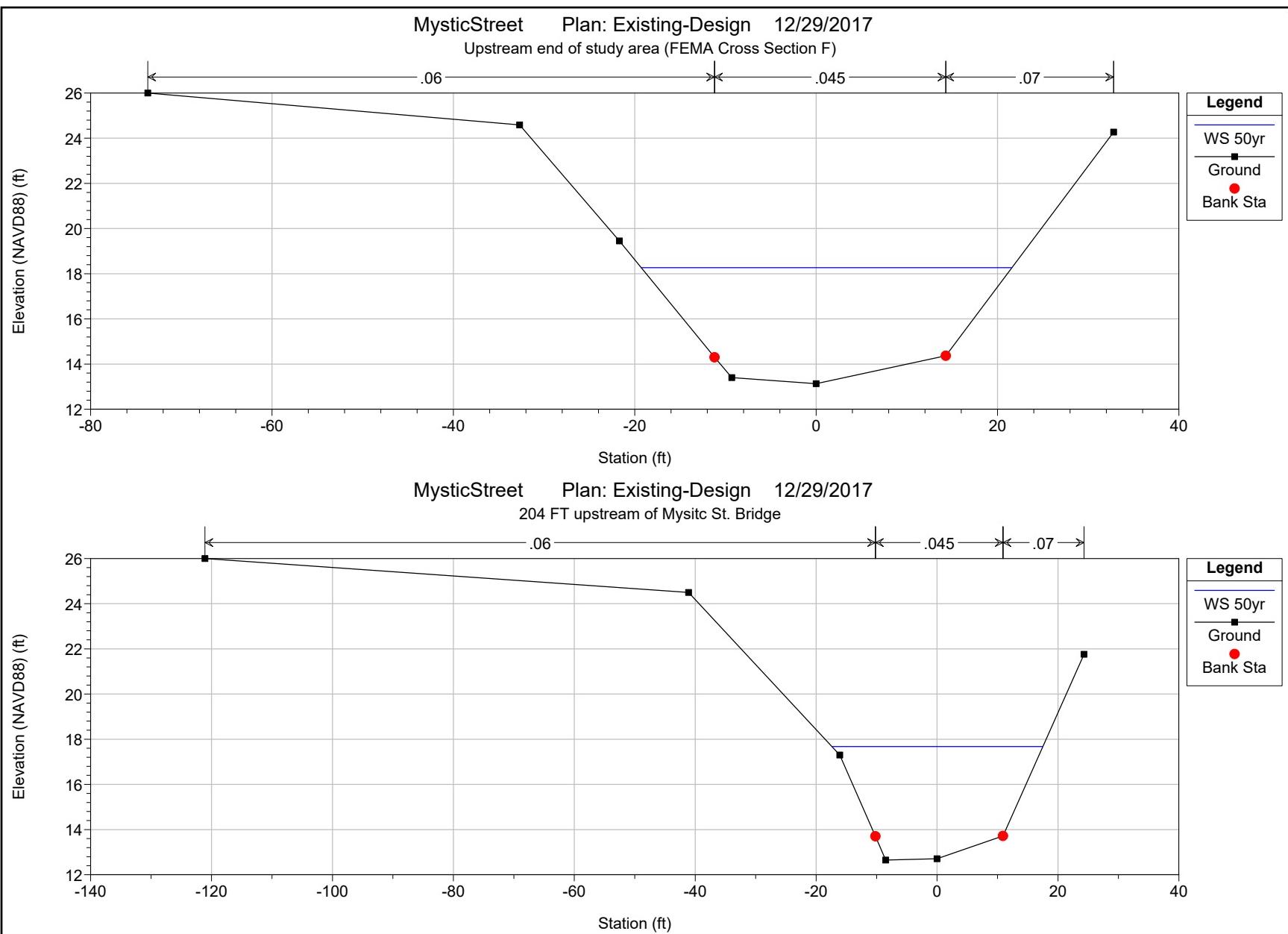
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

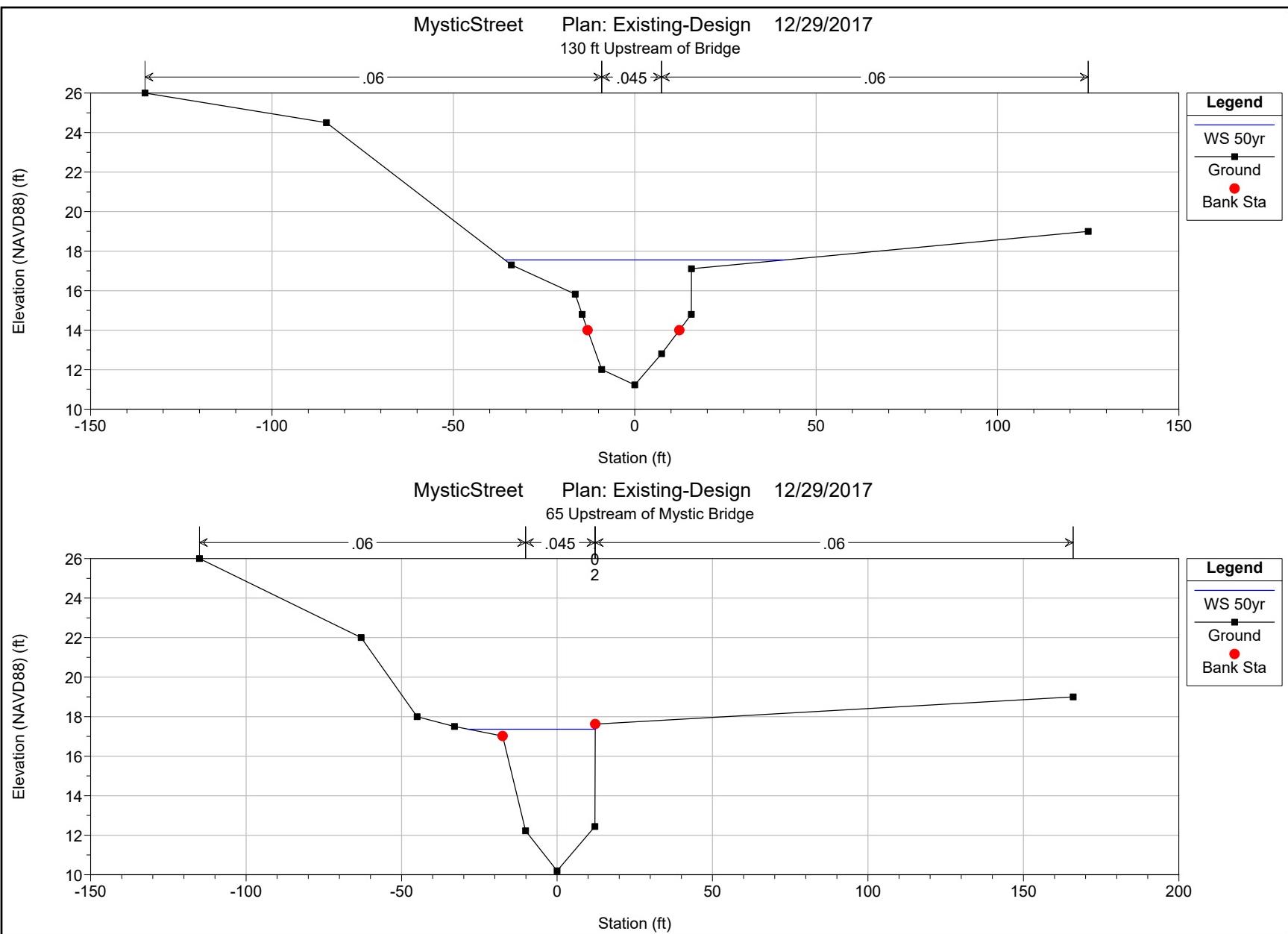
River: Mill Brook

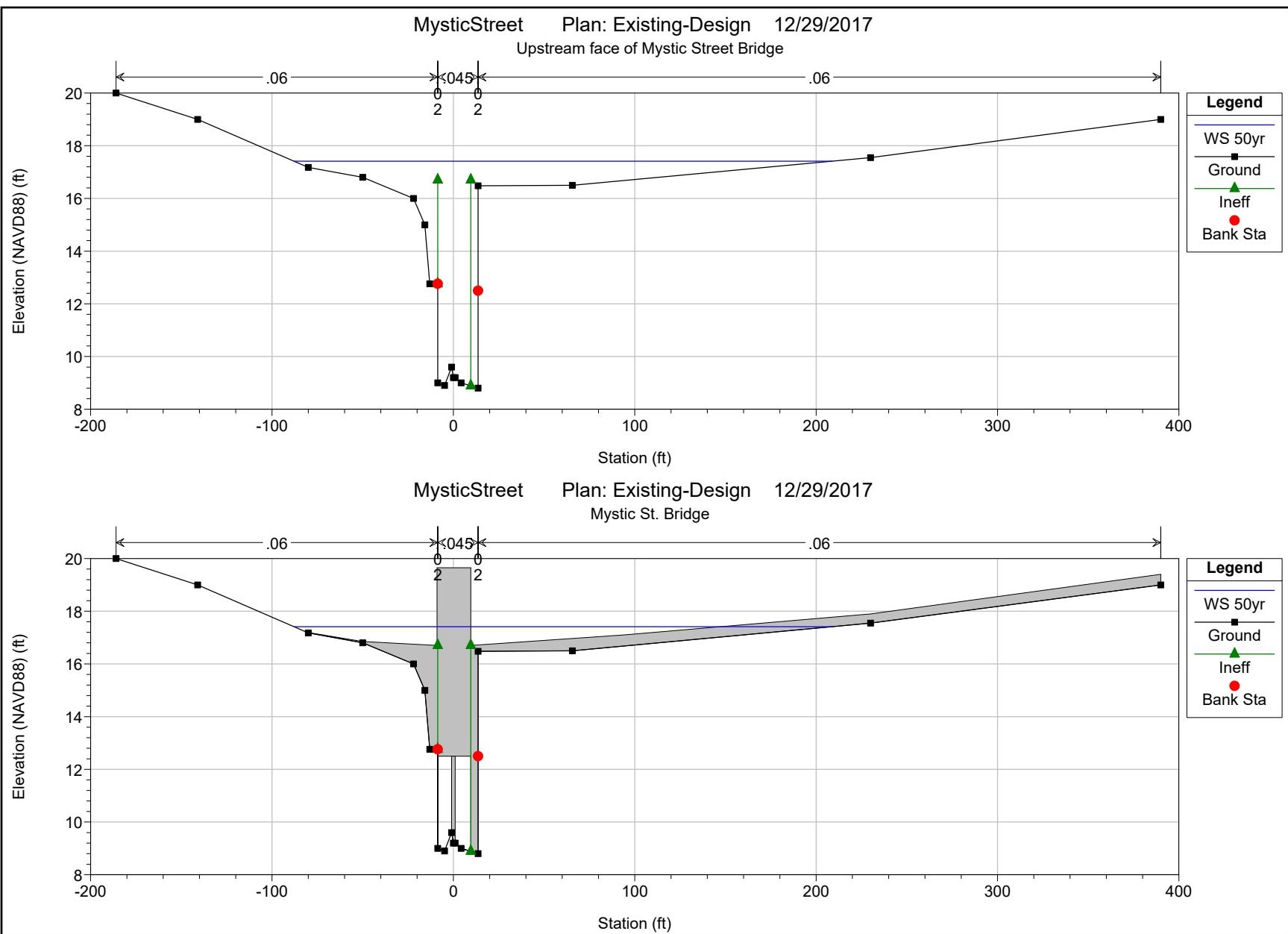
Reach	River Sta.	Contr.	Expan.
Main	458	.1	.3
Main	384	.1	.3
Main	309	.1	.3
Main	244	.1	.3
Main	179	.3	.5
Main	140	Bridge	
Main	115	.3	.5
Main	75	.1	.3
Main	0	.1	.3

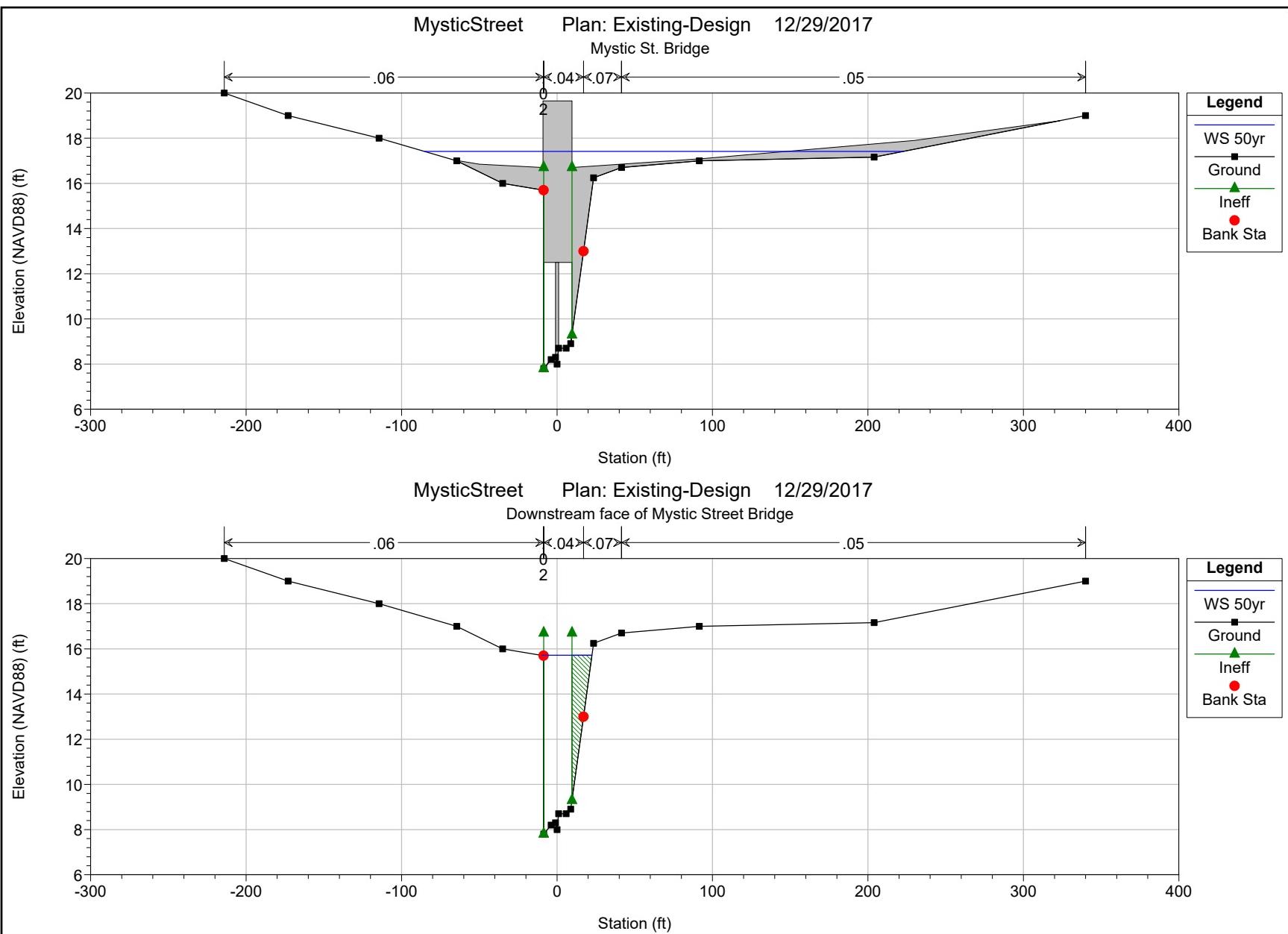
HEC-RAS Plan: Exist-Des River: Mill Brook Reach: Main

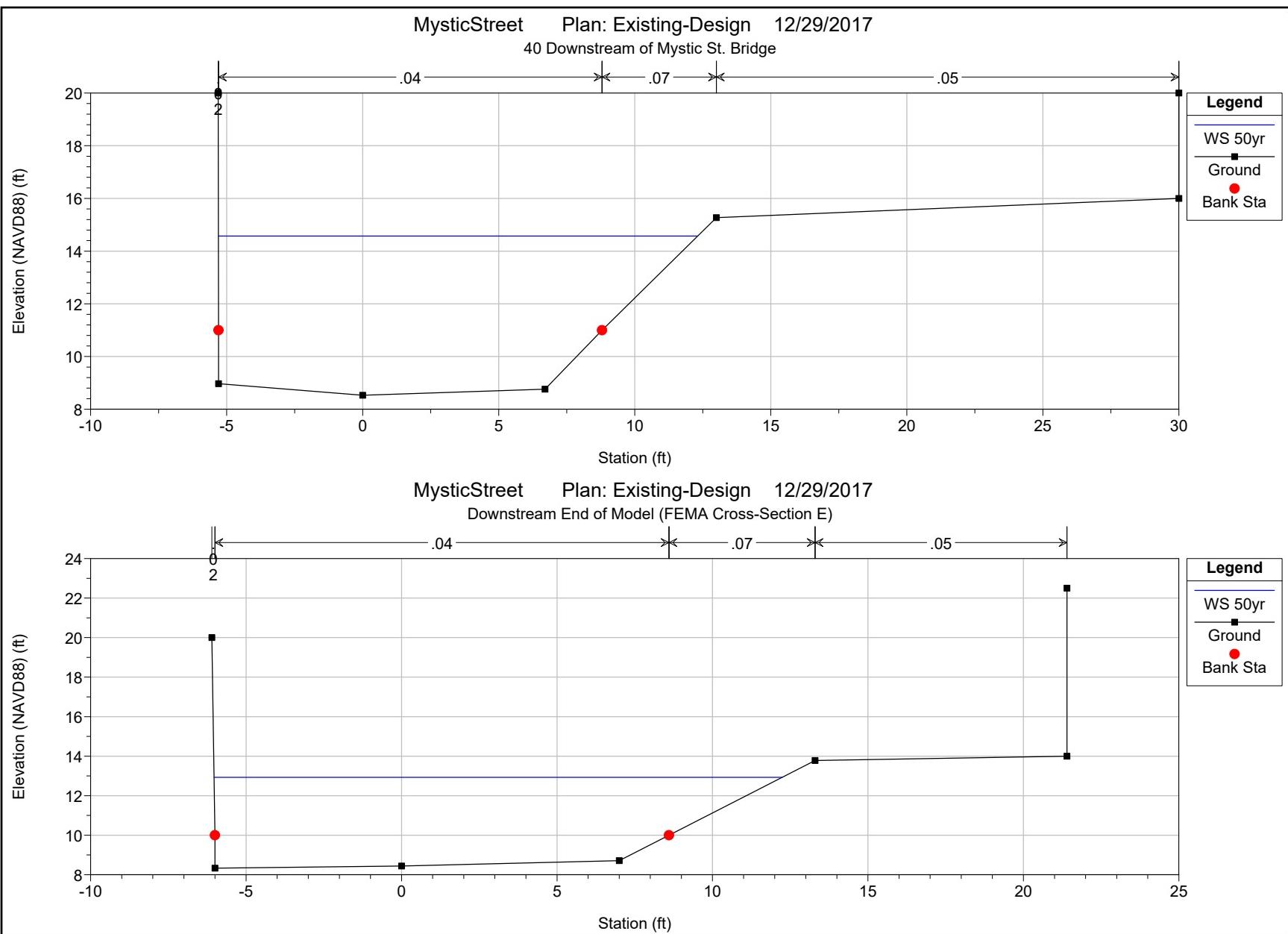
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	0	2yr	201.00	8.33	10.38	10.38	11.29	0.023142	7.64	26.39	15.08	1.00
Main	0	5yr	338.00	8.33	11.14	11.14	12.40	0.020235	9.02	38.13	16.03	0.99
Main	0	10yr	449.00	8.33	11.67	11.67	13.17	0.018853	9.88	46.83	16.69	0.99
Main	0	25yr	612.00	8.33	12.37	12.37	14.19	0.017419	10.89	58.89	17.58	0.99
Main	0	50yr	750.00	8.33	12.93	12.93	14.97	0.016368	11.56	68.88	18.27	0.98
Main	0	100yr	904.00	8.33	13.45	13.45	15.77	0.016138	12.38	78.53	18.92	0.99
Main	0	200yr	1075.00	8.33	14.34	14.34	16.55	0.012526	12.20	99.37	27.44	0.90
Main	0	500yr	1207.00	8.33	14.77	14.77	17.07	0.012053	12.55	111.03	27.45	0.89
Main	75	2yr	201.00	8.53	11.73	10.69	12.11	0.005745	4.98	40.57	14.82	0.52
Main	75	5yr	338.00	8.53	12.63		13.25	0.006464	6.35	54.33	15.70	0.58
Main	75	10yr	449.00	8.53	13.24	12.02	14.04	0.006865	7.23	64.08	16.30	0.61
Main	75	25yr	612.00	8.53	14.01	12.76	15.07	0.007340	8.33	76.93	17.06	0.65
Main	75	50yr	750.00	8.53	14.57	13.34	15.85	0.007712	9.15	86.75	17.62	0.68
Main	75	100yr	904.00	8.53	15.18	13.92	16.67	0.007938	9.93	97.54	18.21	0.70
Main	75	200yr	1075.00	8.53	15.51	14.54	17.40	0.009370	11.16	104.34	23.93	0.76
Main	75	500yr	1207.00	8.53	15.71	15.00	17.93	0.010605	12.12	109.63	28.62	0.82
Main	115	2yr	201.00	7.80	12.14	9.99	12.27	0.001153	2.98	67.46	23.96	0.27
Main	115	5yr	338.00	7.80	13.24	10.64	13.47	0.001368	3.86	87.54	26.18	0.31
Main	115	10yr	449.00	7.80	14.00	11.10	14.30	0.001481	4.43	101.35	27.67	0.33
Main	115	25yr	612.00	7.80	14.98	11.71	15.39	0.001604	5.14	119.16	29.60	0.35
Main	115	50yr	750.00	7.80	15.72	12.18	16.21	0.001687	5.66	132.62	32.56	0.37
Main	115	100yr	904.00	7.80	16.49	12.68	17.08	0.001754	6.17	146.60	82.22	0.38
Main	115	200yr	1075.00	7.80	17.78	13.20	17.98	0.000790	3.96	506.68	353.21	0.24
Main	115	500yr	1207.00	7.80	18.49	13.58	18.61	0.000509	3.35	789.59	445.31	0.19
Main	140	Bridge										
Main	179	2yr	201.00	8.80	12.72	10.63	12.86	0.001643	3.03	66.30	22.22	0.28
Main	179	5yr	338.00	8.80	13.89	11.28	14.13	0.001838	3.86	87.59	27.97	0.31
Main	179	10yr	449.00	8.80	15.32	11.74	15.56	0.001364	3.95	113.58	31.30	0.28
Main	179	25yr	612.00	8.80	17.07	12.36	17.21	0.000639	3.13	292.53	225.49	0.19
Main	179	50yr	750.00	8.80	17.41	12.83	17.58	0.000727	3.44	383.92	296.71	0.21
Main	179	100yr	904.00	8.80	17.69	13.32	17.86	0.000822	3.73	472.83	342.76	0.22
Main	179	200yr	1075.00	8.80	18.02	13.85	18.19	0.000844	3.88	594.54	390.52	0.23
Main	179	500yr	1207.00	8.80	18.51	14.23	18.64	0.000659	3.55	801.80	460.58	0.20
Main	244	2yr	201.00	10.20	12.65	12.64	13.31	0.027808	6.51	30.85	22.96	0.99
Main	244	5yr	338.00	10.20	13.96		14.42	0.009262	5.41	62.44	25.02	0.60
Main	244	10yr	449.00	10.20	15.41		15.72	0.004109	4.48	100.30	27.28	0.41
Main	244	25yr	612.00	10.20	17.05		17.32	0.002578	4.16	147.15	30.82	0.33
Main	244	50yr	750.00	10.20	17.36		17.72	0.003161	4.79	158.31	40.88	0.37
Main	244	100yr	904.00	10.20	17.59		18.06	0.003987	5.52	168.15	47.34	0.42
Main	244	200yr	1075.00	10.20	17.83		18.43	0.004799	6.24	183.27	77.23	0.46
Main	244	500yr	1207.00	10.20	18.27		18.87	0.004441	6.31	229.47	131.31	0.45
Main	309	2yr	201.00	11.23	14.10		14.40	0.010701	4.40	45.69	25.90	0.58
Main	309	5yr	338.00	11.23	14.63		15.13	0.012690	5.69	60.30	29.09	0.66
Main	309	10yr	449.00	11.23	15.68		16.07	0.006219	5.10	92.43	31.74	0.49
Main	309	25yr	612.00	11.23	17.20		17.52	0.003115	4.63	152.89	53.91	0.37
Main	309	50yr	750.00	11.23	17.56		17.95	0.003570	5.19	176.25	77.42	0.40
Main	309	100yr	904.00	11.23	17.85		18.32	0.004082	5.76	202.01	96.65	0.43
Main	309	200yr	1075.00	11.23	18.23		18.74	0.004224	6.12	243.00	121.11	0.44
Main	309	500yr	1207.00	11.23	18.70		19.14	0.003594	5.93	306.16	151.24	0.41
Main	384	2yr	201.00	12.65	14.83		15.23	0.010925	5.12	40.77	24.80	0.67
Main	384	5yr	338.00	12.65	15.45		16.05	0.011409	6.34	56.70	26.84	0.71
Main	384	10yr	449.00	12.65	16.05		16.71	0.009356	6.65	73.52	28.84	0.67
Main	384	25yr	612.00	12.65	17.33		17.88	0.005077	6.18	112.95	33.10	0.52
Main	384	50yr	750.00	12.65	17.67		18.37	0.005796	6.96	124.81	34.89	0.57
Main	384	100yr	904.00	12.65	17.95		18.83	0.006880	7.87	134.47	36.28	0.62
Main	384	200yr	1075.00	12.65	18.24		19.33	0.007907	8.76	145.28	37.79	0.67
Main	384	500yr	1207.00	12.65	18.56		19.75	0.008031	9.19	157.61	39.43	0.69
Main	458	2yr	201.00	13.13	15.58	14.82	15.81	0.005564	3.88	53.93	30.36	0.48
Main	458	5yr	338.00	13.13	16.31	15.34	16.64	0.005354	4.69	77.22	33.22	0.50
Main	458	10yr	449.00	13.13	16.84	15.70	17.24	0.005062	5.13	95.52	35.31	0.50
Main	458	25yr	612.00	13.13	17.81	16.19	18.21	0.003749	5.25	131.59	39.10	0.45
Main	458	50yr	750.00	13.13	18.27	16.55	18.74	0.003915	5.75	149.69	40.87	0.47
Main	458	100yr	904.00	13.13	18.69	16.92	19.25	0.004160	6.28	167.42	42.53	0.49
Main	458	200yr	1075.00	13.13	19.15	17.31	19.79	0.004311	6.77	187.31	44.32	0.51
Main	458	500yr	1207.00	13.13	19.52	17.61	20.22	0.004285	7.04	204.23	45.79	0.51











Existing Conditions -FEMA Flows

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

X	X	XXXXXX	XXXX	XXXX	XX	XXXX
X	X	X	X X	X X	X X	X
X	X	X	X	X X	X X	X
XXXXXX	XXXX	X	XXX	XXXX	XXXXXX	XXXX
X	X	X	X	X X	X X	X
X	X	X	X X	X X	X X	X
X	X	XXXXXX	XXXX	X X	X X	XXXXX

PROJECT DATA

Project Title: MysticStreet
Project File : MysticStreet.prj
Run Date and Time: 12/29/2017 1:04:42 PM

Project in English units

Project Description:

Project: Mystic Street Bridge Replacement in Arlington, MA
Done by: LEC and
RSV
Datum: NAVD88

PLAN DATA

Plan Title: Existing - FEMA
Plan File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.p04

Geometry Title: Existing
Geometry File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.g01

Flow Title : FEMA Flows
Flow File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.f01

Plan Description:

Existing conditions with FEMA Flows

Plan Summary Information:

Number of: Cross Sections =	8	Multiple Openings =	0
Culverts =	0	Inline Structures =	0
Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3

Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary

Conveyance Calculation Method: At breaks in n values only

Friction Slope Method: Average Conveyance

Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: FEMA Flows

Flow File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.f01

Flow Data (cfs)

River	Reach	RS	10yr	50yr
100yr	500yr	200yr		
Mill Brook	Main	458	150	310
450	730	540		

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
Mill Brook	Main	10yr	Normal S = 0.063
Known WS = 10			
Mill Brook	Main	50yr	Normal S = 0.063
Known WS = 10.6			
Mill Brook	Main	100yr	Normal S = 0.063
Known WS = 10.8			
Mill Brook	Main	500yr	Normal S = 0.063
Known WS = 11.9			
Mill Brook	Main	200yr	Normal S = 0.063
Known WS = 11.5			

GEOMETRY DATA

Geometry Title: Existing

Geometry File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.g01

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 458

INPUT

Description: Upstream end of study area (FEMA Cross Section F)

Station	Elevation								
Sta	Elev								
-73.7	26	-32.7	24.59	-21.7	19.45	-11.2	14.3	-9.3	13.4
0	13.13	14.3	14.37	32.8	24.27				

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 -73.7 .06 -11.2 .045 14.3 .07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 -11.2 14.3 77 74 70 .1 .3

CROSS SECTION

RIVER: Mill Brook
 REACH: Main RS: 384

INPUT
 Description: 204 FT upstream of Mysitc St. Bridge
 Station Elevation Data num= 8
 Sta Elev Sta Elev Sta Elev Sta Elev
 -121.1 26 -41.1 24.5 -16.1 17.3 -10.2 13.7 -8.5 12.65
 0 12.71 10.9 13.72 24.3 21.76

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 -121.1 .06 -10.2 .045 10.9 .07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 -10.2 10.9 67 74 78 .1 .3

CROSS SECTION

RIVER: Mill Brook
 REACH: Main RS: 309

INPUT
 Description: 130 ft Upstream of Bridge
 Station Elevation Data num= 13
 Sta Elev Sta Elev Sta Elev Sta Elev
 -135 26 -85 24.5 -34 17.3 -16.4 15.82 -14.5 14.8
 -13 14 -9.1 12.01 0 11.23 7.4 12.81 12.3 14
 15.6 14.8 15.61 17.11 125 19

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 -135 .06 -9.1 .045 7.4 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 -13 12.3 66 65 65 .1 .3

CROSS SECTION

RIVER: Mill Brook
 REACH: Main RS: 244

INPUT
 Description: 65 Upstream of Mystic Bridge
 Station Elevation Data num= 10
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 -115 26 -63 22 -45 18 -33 17.5 -17.5 17.02
 -10.1 12.22 0 10.2 12.2 12.44 12.3 17.62 166 19

Manning's n Values num= 4
 Sta n Val Sta n Val Sta n Val Sta n Val

-115	.06	-10.1	.045	12.2	.02	12.3	.06
Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff Contr.
-17.5	12.3			66	66	66	.1 .3

CROSS SECTION

RIVER: Mill Brook
REACH: Main RS: 179

INPUT

Description: Upstream face of Mystic Street Bridge

Station Elevation Data	num=	20							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-186	20	-141	19	-80	17.18	-50	16.8	-22	16
-15.7	15	-13	12.76	-8.61	12.76	-8.6	9	-4.85	8.9
-1	9.6	0	9.2	1	9.2	4.3	9	13.6	8.8
13.61	12.5	13.62	16.48	65.6	16.5	230	17.55	390	19

Manning's n Values	num=	5							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-186	.06	-8.61	.02	-8.6	.045	13.6	.02	13.61	.06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff Contr.	Expan.
	-8.61	13.61		63	63	66	.3	.5

Ineffective Flow	num=	2	
Sta L	Sta R	Elev	Permanent
-186	-8.61	16.7	F
9.6	390	16.7	F

BRIDGE

RIVER: Mill Brook
REACH: Main RS: 140

INPUT

Description: Mystic St. Bridge

Distance from Upstream XS = .5
Deck/Roadway Width = 62
Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num=	12								
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-107	17.5	0	-50	16.85	0	-9	16.7	0	0
-9	19.65	0	-8.6	19.65	0	-8.6	19.65	12.5	
0	19.65	12.5	9.6	19.65	12.5	9.6	16.7	0	
94	17.1	0	230	17.9		390	19.4		

Upstream Bridge Cross Section Data

Station Elevation Data	num=	20							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-186	20	-141	19	-80	17.18	-50	16.8	-22	16
-15.7	15	-13	12.76	-8.61	12.76	-8.6	9	-4.85	8.9
-1	9.6	0	9.2	1	9.2	4.3	9	13.6	8.8
13.61	12.5	13.62	16.48	65.6	16.5	230	17.55	390	19

Manning's n Values	num=	5							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-186	.06	-8.61	.02	-8.6	.045	13.6	.02	13.61	.06

Bank Sta: Left Right Coeff Contr. Expan.

-8.61	13.61	.3	.5
Ineffective Flow		num=	2
Sta L	Sta R	Elev	Permanent
-186	-8.61	16.7	F
9.6	390	16.7	F

Downstream Deck/Roadway Coordinates

num=	12													
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-107	17.5	0	-50	16.85	0	-9	16.7	0	0	-9	16.7	0	0	0
-9	19.65	0	-8.6	19.65	0	-8.6	19.65	12.5	0	-8.6	19.65	12.5	0	0
0	19.65	12.5	9.6	19.65	12.5	9.6	16.7	0	0	9.6	16.7	0	0	0
94	17.1	0	230	17.9	390	19.4	0	0	0	390	19.4	0	0	0

Downstream Bridge Cross Section Data

Station	Elevation	Data	num=	19							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-214	20	-173	19	-114.5	18	-64.5	17	-35	16		
-8.61	15.7	-8.6	7.8	-3.8	8.2	-1	8.3	0	8		
1	8.7	5.9	8.7	8.8	8.9	17.1	13	23.5	16.25		
41.5	16.7	91.5	17	204	17.16	340	19				

Manning's n Values	num=	5							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-214	.06	-8.61	.02	-8.6	.04	17.1	.07	41.5	.05

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
-8.61	17.1		.3	.5	

Ineffective Flow	num=	2	
Sta L	Sta R	Elev	Permanent
-214	-8.6	16.7	F
9.6	340	16.7	F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical

Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98

Elevation at which weir flow begins = 16.7

Energy head used in spillway design =

Spillway height used in design =

Weir crest shape = Broad Crested

Number of Piers = 1

Pier Data

Pier Station	Upstream=	0	Downstream=	0
--------------	-----------	---	-------------	---

Upstream	num=	2
----------	------	---

Width	Elev	Width	Elev
2	7	2	12.8

Downstream	num=	2
------------	------	---

Width	Elev	Width	Elev
2	7	2	12.8

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Pressure and Weir flow

Submerged Inlet Cd =

Submerged Inlet + Outlet Cd = .8

Max Low Cord = 12.5

Additional Bridge Parameters

Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 115

INPUT

Description: Downstream face of Mystic Street Bridge

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-214	20	-173	19	-114.5	18	-64.5	17	-35	16
-8.61	15.7	-8.6	7.8	-3.8	8.2	-1	8.3	0	8
1	8.7	5.9	8.7	8.8	8.9	17.1	13	23.5	16.25
41.5	16.7	91.5	17	204	17.16	340	19		

Manning's n Values

num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-214	.06	-8.61	.02	-8.6	.04	17.1	.07	41.5	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Sta	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
-8.61	17.1		45	40	30		.3	.5	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-214	-8.6	16.7	F
9.6	340	16.7	F

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 75

INPUT

Description: 40 Downstream of Mystic St. Bridge

Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-5.31	20	-5.3	11	-5.3	8.97	0	8.53	6.7	8.76
8.8	11	13	15.27	30	16	30	20		

Manning's n Values

num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-5.31	.02	-5.3	.04	8.8	.07	13	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Sta	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
-5.3	8.8		75	75	74		.1	.3	

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 0

INPUT

Description: Downstream End of Model (FEMA Cross-Section E)

Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-6.1	20	-6	10	-6	8.33	0	8.44	7	8.71
8.6	10	13.3	13.78	21.4	14	21.4	22.5		

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-6.1	.02	-6	.04	8.6	.07	13.3	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

	-6	8.6	0	0	0	.1	.3
--	----	-----	---	---	---	----	----

SUMMARY OF MANNING'S N VALUES

River: Mill Brook

Reach	River Sta.	n1	n2	n3	n4	n5
Main	458	.06	.045	.07		
Main	384	.06	.045	.07		
Main	309	.06	.045	.06		
Main	244	.06	.045	.02	.06	
Main	179	.06	.02	.045	.02	.06
Main	140	Bridge				
Main	115	.06	.02	.04	.07	.05
Main	75	.02	.04	.07	.05	
Main	0	.02	.04	.07	.05	

SUMMARY OF REACH LENGTHS

River: Mill Brook

Reach	River Sta.	Left	Channel	Right
Main	458	77	74	70
Main	384	67	74	78
Main	309	66	65	65
Main	244	66	66	66
Main	179	63	63	66
Main	140	Bridge		
Main	115	45	40	30
Main	75	75	75	74
Main	0	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

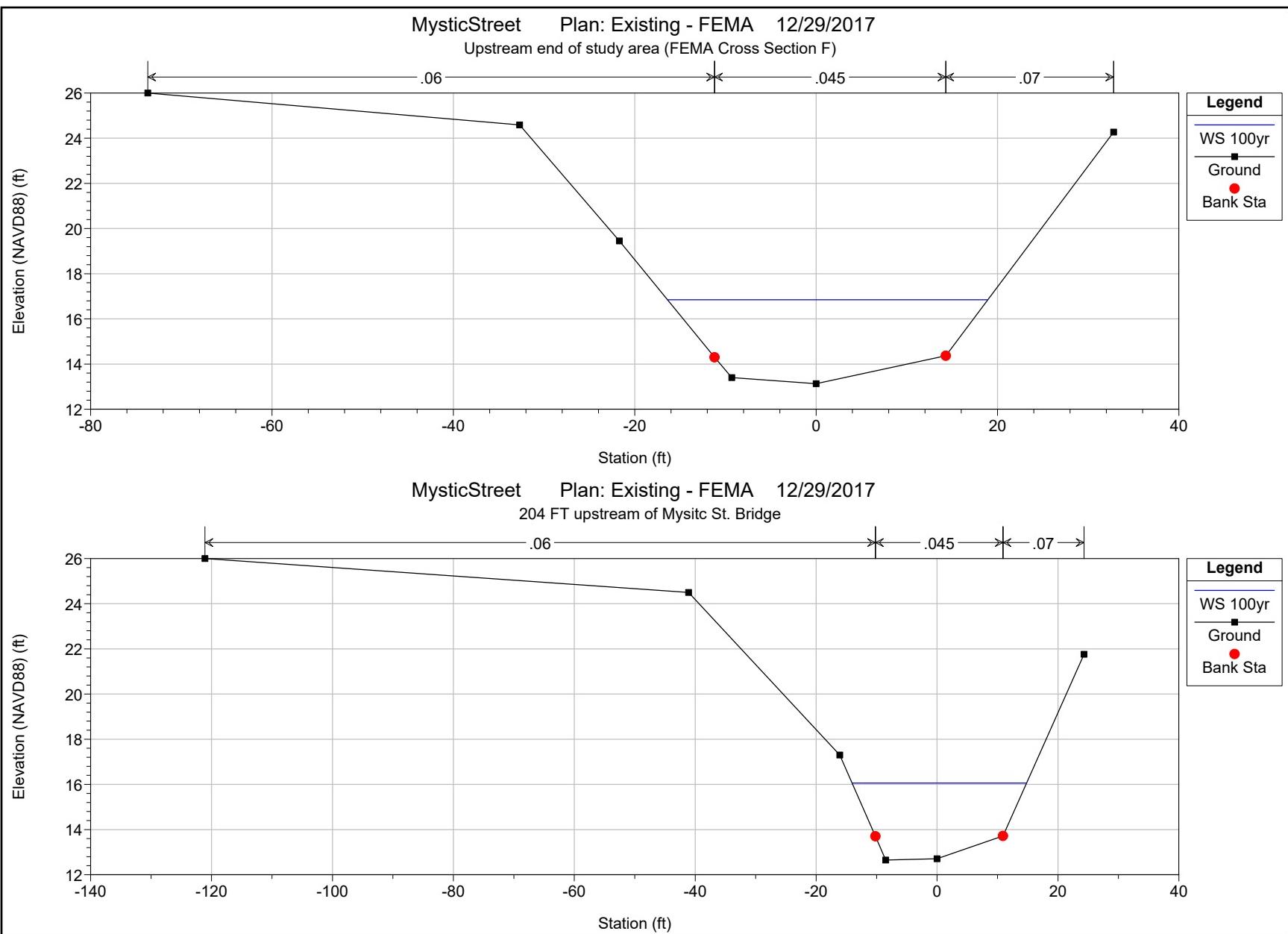
River: Mill Brook

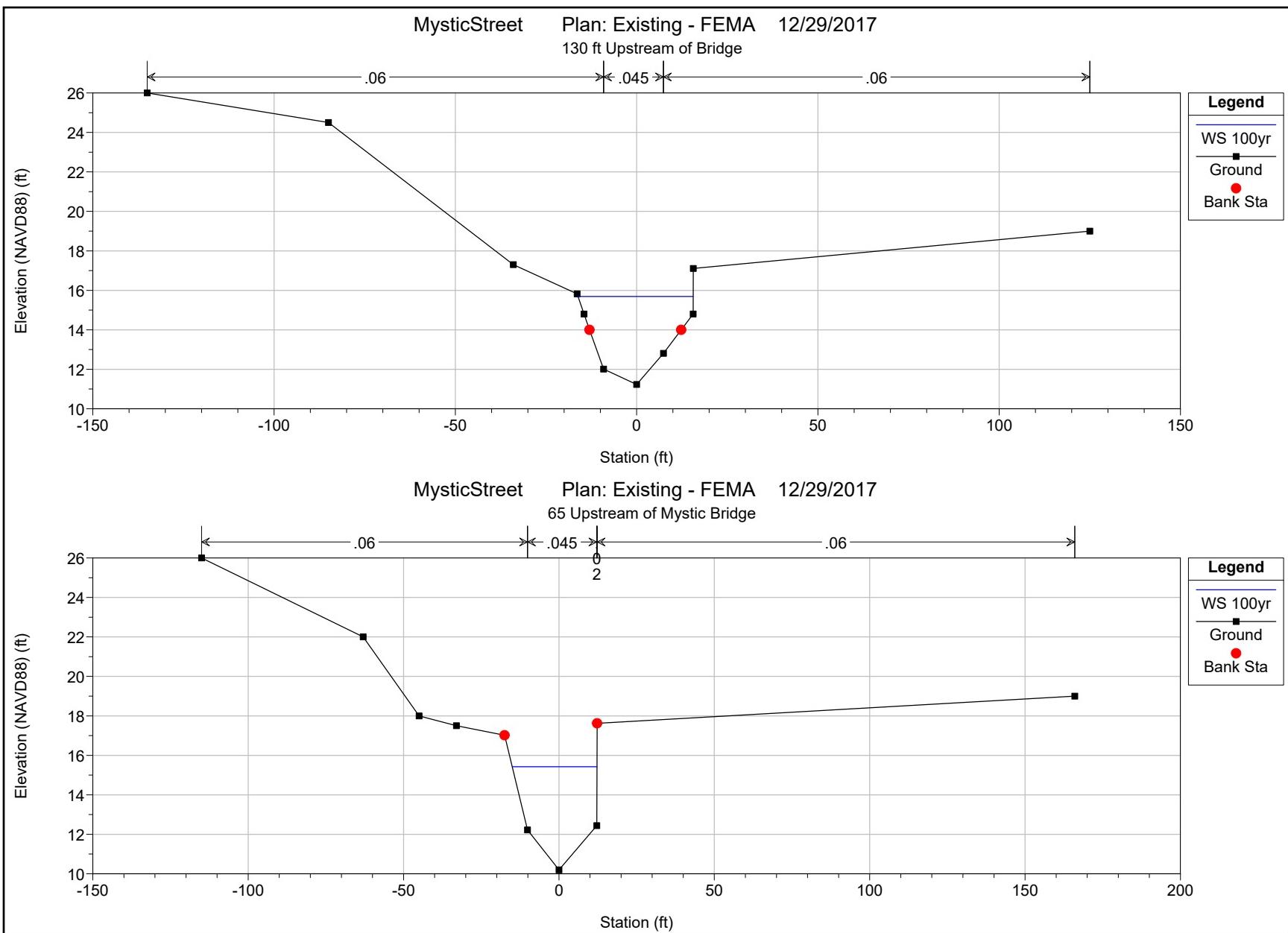
Reach	River Sta.	Contr.	Expan.
Main	458	.1	.3
Main	384	.1	.3
Main	309	.1	.3
Main	244	.1	.3
Main	179	.3	.5
Main	140	Bridge	

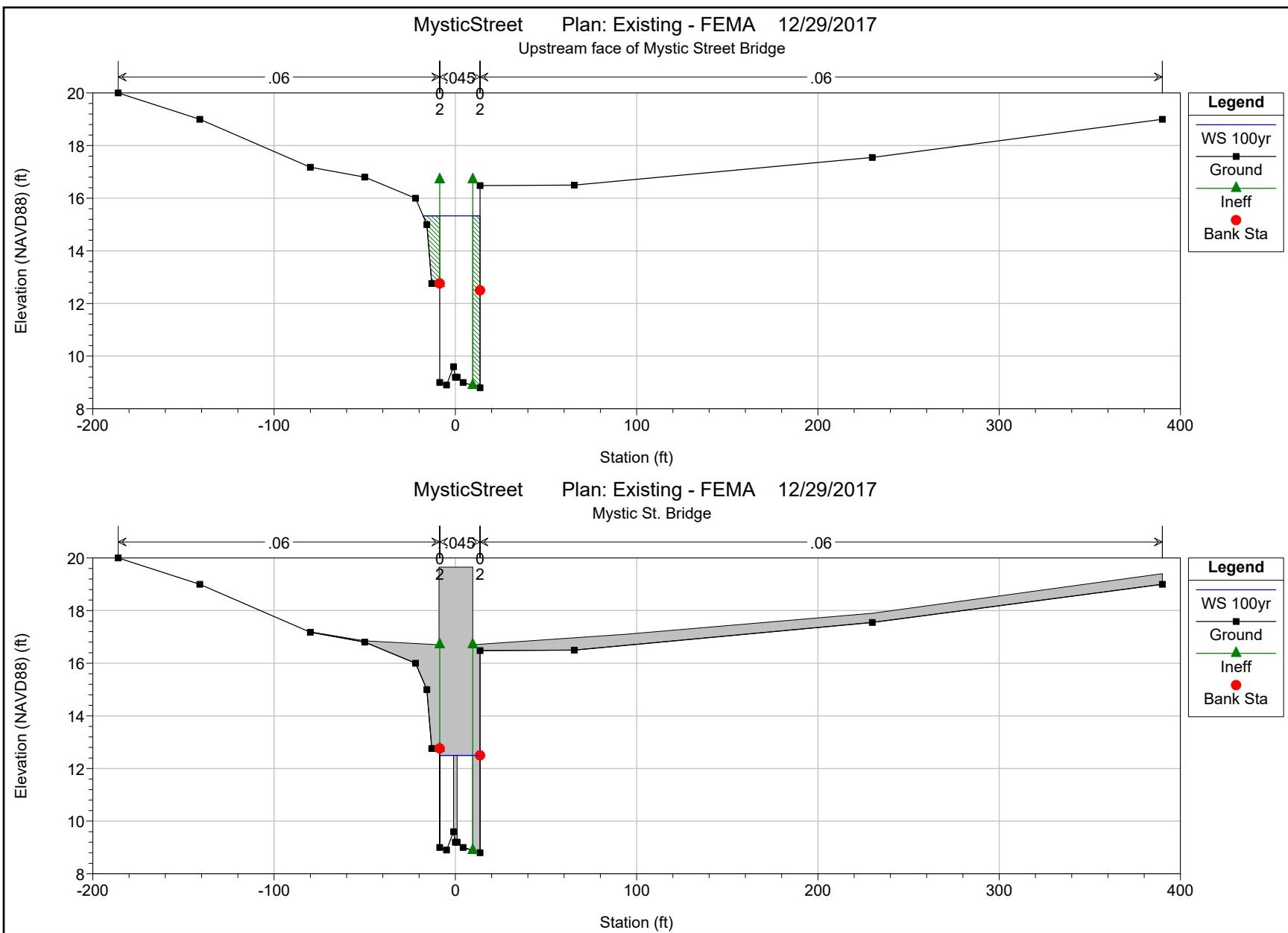
Main	115	.3	.5
Main	75	.1	.3
Main	0	.1	.3

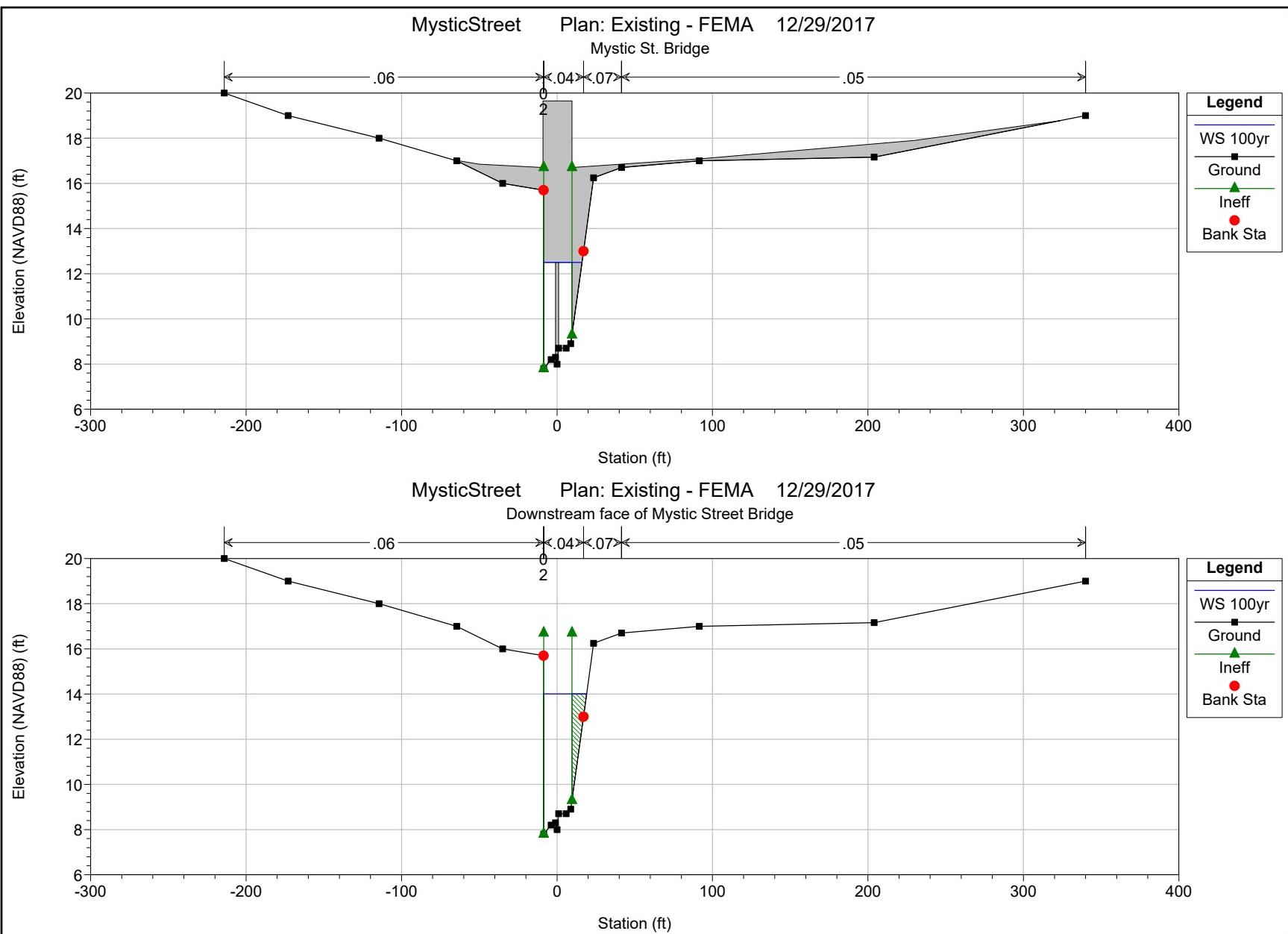
HEC-RAS Plan: Exist-FEMA River: Mill Brook Reach: Main

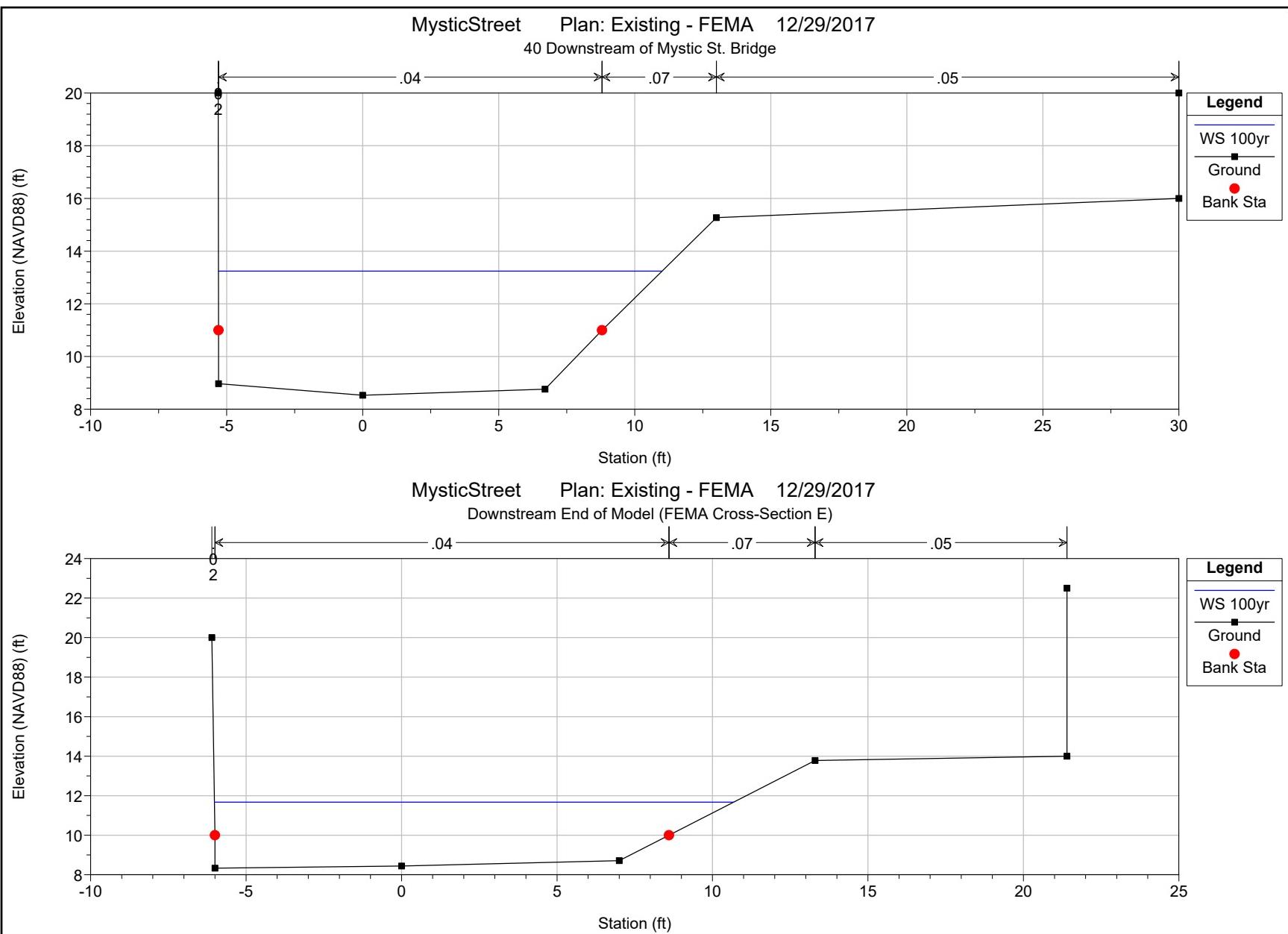
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	0	10yr	150.00	8.33	10.07	10.07	10.81	0.024644	6.93	21.66	14.68	1.00
Main	0	50yr	310.00	8.33	11.00	11.00	12.19	0.020657	8.77	35.85	15.85	1.00
Main	0	100yr	450.00	8.33	11.67	11.67	13.18	0.018842	9.88	46.90	16.70	0.99
Main	0	500yr	730.00	8.33	12.86	12.86	14.86	0.016461	11.46	67.51	18.18	0.98
Main	75	10yr	150.00	8.53	11.31	10.35	11.61	0.005396	4.35	34.52	14.41	0.49
Main	75	50yr	310.00	8.53	12.46		13.04	0.006347	6.10	51.70	15.54	0.57
Main	75	100yr	450.00	8.53	13.24	12.03	14.05	0.006868	7.23	64.16	16.31	0.61
Main	75	500yr	730.00	8.53	14.50	13.26	15.74	0.007657	9.04	85.39	17.54	0.67
Main	115	10yr	150.00	7.80	11.64	9.71	11.74	0.001035	2.57	58.47	22.96	0.25
Main	115	50yr	310.00	7.80	13.03	10.51	13.24	0.001333	3.70	83.76	25.77	0.30
Main	115	100yr	450.00	7.80	14.01	11.10	14.31	0.001482	4.44	101.47	27.69	0.33
Main	115	500yr	730.00	7.80	15.61	12.11	16.10	0.001675	5.58	130.75	30.86	0.37
Main	140	Bridge										
Main	179	10yr	150.00	8.80	11.83	10.36	11.97	0.002285	2.99	50.11	22.22	0.32
Main	179	50yr	310.00	8.80	13.55	11.16	13.78	0.001978	3.81	81.35	27.56	0.32
Main	179	100yr	450.00	8.80	15.33	11.74	15.58	0.001360	3.95	113.82	31.39	0.28
Main	179	500yr	730.00	8.80	17.37	12.76	17.54	0.000713	3.39	372.20	289.11	0.21
Main	244	10yr	150.00	10.20	12.38	12.38	12.95	0.030274	6.06	24.73	22.21	1.01
Main	244	50yr	310.00	10.20	13.61		14.13	0.012287	5.78	53.59	24.46	0.69
Main	244	100yr	450.00	10.20	15.43		15.74	0.004085	4.47	100.67	27.30	0.41
Main	244	500yr	730.00	10.20	17.33		17.67	0.003061	4.69	156.95	39.79	0.36
Main	309	10yr	150.00	11.23	13.80		14.04	0.009984	3.94	38.08	24.06	0.55
Main	309	50yr	310.00	11.23	14.48		14.96	0.013453	5.60	55.89	28.17	0.67
Main	309	100yr	450.00	11.23	15.69		16.08	0.006173	5.09	92.80	31.76	0.49
Main	309	500yr	730.00	11.23	17.52		17.89	0.003497	5.11	173.05	74.69	0.39
Main	384	10yr	150.00	12.65	14.52		14.85	0.011405	4.62	33.26	23.78	0.66
Main	384	50yr	310.00	12.65	15.33		15.90	0.011320	6.12	53.65	26.46	0.71
Main	384	100yr	450.00	12.65	16.06		16.72	0.009314	6.65	73.75	28.87	0.67
Main	384	500yr	730.00	12.65	17.63		18.31	0.005664	6.84	123.40	34.68	0.56
Main	458	10yr	150.00	13.13	15.25		15.44	0.005654	3.48	44.34	29.10	0.47
Main	458	50yr	310.00	13.13	16.17		16.48	0.005384	4.54	72.71	32.69	0.50
Main	458	100yr	450.00	13.13	16.85		17.24	0.005056	5.14	95.71	35.33	0.50
Main	458	500yr	730.00	13.13	18.21		18.67	0.003880	5.67	147.30	40.64	0.46











Existing Conditions -Floodway

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

X	X	XXXXXX	XXXX	XXXX	XX	XXXX
X	X	X	X X	X X	X X	X
X	X	X	X	X X	X X	X
XXXXXX	XXXX	X	XXX	XXXX	XXXXXX	XXXX
X	X	X	X	X X	X X	X
X	X	X	X X	X X	X X	X
X	X	XXXXXX	XXXX	X X	X X	XXXXX

PROJECT DATA

Project Title: MysticStreet
Project File : MysticStreet.prj
Run Date and Time: 12/29/2017 1:08:15 PM

Project in English units

Project Description:

Project: Mystic Street Bridge Replacement in Arlington, MA
Done by: LEC and
RSV
Datum: NAVD88

PLAN DATA

Plan Title: Existing - Floodway
Plan File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.p06

Geometry Title: Existing
Geometry File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.g01

Flow Title : FEMA Floodway Flows
Flow File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.f02

Plan Description:

Existing conditions with FEMA Floodway Flows

Plan Summary Information:

Number of: Cross Sections =	8	Multiple Openings =	0
Culverts =	0	Inline Structures =	0
Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3

Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary

Conveyance Calculation Method: At breaks in n values only

Friction Slope Method: Average Conveyance

Computational Flow Regime: Subcritical Flow

Encroachment Data

Equal Conveyance = True

Left Offset = 0

Right Offset = 0

River	Reach	RS	Profile	Method	Value1	Value2
Mill Brook	Main	458	100yr Floodway	1	-17	22
		384	100yr Floodway	1	-36	24
		309	100yr Floodway	1	-38	48
		244	100yr Floodway	1	-25	35
		179	100yr Floodway	1	-45	25
		115	100yr Floodway	1	-25	17
		75	100yr Floodway	1	-25	11
		0	100yr Floodway	1	-45	18

FLOW DATA

Flow Title: FEMA Floodway Flows

Flow File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.f02

Flow Data (cfs)

River	Reach	RS	100yr	100yr Floodway
Mill Brook	Main	458	450	450

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
Mill Brook	Main	100yr	Normal S = 0.063
Known WS = 10.8			
Mill Brook	Main	100yr Floodway	Normal S = 0.063
Known WS = 10.9			

GEOMETRY DATA

Geometry Title: Existing

Geometry File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.g01

CROSS SECTION

RIVER: Mill Brook

REACH: Main

RS: 458

INPUT

Description: Upstream end of study area (FEMA Cross Section F)

Station Elevation Data				num= 8			
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-73.7	26	-32.7	24.59	-21.7	19.45	-11.2	14.3
0	13.13	14.3	14.37	32.8	24.27	-9.3	13.4

Manning's n Values

num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
-73.7	.06	-11.2	.045	14.3	.07

Bank Sta: Left Right		Lengths: Left Channel			Right	Coeff Contr.	Expan.
		77	74	70		.1	.3

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 384

INPUT

Description: 204 FT upstream of Mysitc St. Bridge

Station Elevation Data				num= 8			
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-121.1	26	-41.1	24.5	-16.1	17.3	-10.2	13.7
0	12.71	10.9	13.72	24.3	21.76	-8.5	12.65

Manning's n Values

num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
-121.1	.06	-10.2	.045	10.9	.07

Bank Sta: Left Right		Lengths: Left Channel			Right	Coeff Contr.	Expan.
		67	74	78		.1	.3

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 309

INPUT

Description: 130 ft Upstream of Bridge

Station Elevation Data				num= 13			
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-135	26	-85	24.5	-34	17.3	-16.4	15.82
-13	14	-9.1	12.01	0	11.23	7.4	-14.5
15.6	14.8	15.61	17.11	125	19	12.81	14.8

Manning's n Values

num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
-135	.06	-9.1	.045	7.4	.06

Bank Sta: Left Right		Lengths: Left Channel			Right	Coeff Contr.	Expan.
		66	65	65		.1	.3

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 244

INPUT

Description: 65 Upstream of Mystic Bridge

Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-115	26	-63	22	-45	18	-33	17.5	-17.5	17.02
-10.1	12.22	0	10.2	12.2	12.44	12.3	17.62	166	19

Manning's n Values

num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-115	.06	-10.1	.045	12.2	.02	12.3	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Sta	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	-17.5	12.3		66	66	66	.1		.3

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 179

INPUT

Description: Upstream face of Mystic Street Bridge

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-186	20	-141	19	-80	17.18	-50	16.8	-22	16
-15.7	15	-13	12.76	-8.61	12.76	-8.6	9	-4.85	8.9
-1	9.6	0	9.2	1	9.2	4.3	9	13.6	8.8
13.61	12.5	13.62	16.48	65.6	16.5	230	17.55	390	19

Manning's n Values

num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-186	.06	-8.61	.02	-8.6	.045	13.6	.02	13.61	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Sta	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	-8.61	13.61		63	63	66	.3		.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-186	-8.61	16.7	F
9.6	390	16.7	F

BRIDGE

RIVER: Mill Brook

REACH: Main RS: 140

INPUT

Description: Mystic St. Bridge

Distance from Upstream XS = .5

Deck/Roadway Width = 62

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 12

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-107	17.5	0	-50	16.85	0	-9	16.7	0	0
-9	19.65	0	-8.6	19.65	0	-8.6	19.65	12.5	0
0	19.65	12.5	9.6	19.65	12.5	9.6	16.7	0	0
94	17.1	0	230	17.9		390	19.4		

Upstream Bridge Cross Section Data

Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-186	20	-141	19	-80	17.18	-50	16.8	-22	16
-15.7	15	-13	12.76	-8.61	12.76	-8.6	9	-4.85	8.9

-1	9.6	0	9.2	1	9.2	4.3	9	13.6	8.8
13.61	12.5	13.62	16.48	65.6	16.5	230	17.55	390	19

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-186	.06	-8.61	.02	-8.6	.045	13.6	.02	13.61	.06

Bank Sta: Left Right Coeff Contr. Expan.

-8.61	13.61	.3	.5
-------	-------	----	----

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-186	-8.61	16.7	F
9.6	390	16.7	F

Downstream Deck/Roadway Coordinates

num= 12

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-107	17.5	0	-50	16.85	0	-9	16.7	0	0	-9	19.65	12.5	0	0
-9	19.65	0	-8.6	19.65	0	-8.6	19.65	12.5	9.6	16.7	0	9.6	16.7	0
0	19.65	12.5	9.6	19.65	12.5	390	19.4	0	94	17.1	0	230	17.9	0

Downstream Bridge Cross Section Data

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-214	20	-173	19	-114.5	18	-64.5	17	-35	16
-8.61	15.7	-8.6	7.8	-3.8	8.2	-1	8.3	0	8
1	8.7	5.9	8.7	8.8	8.9	17.1	13	23.5	16.25
41.5	16.7	91.5	17	204	17.16	340	19	0	0

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-214	.06	-8.61	.02	-8.6	.04	17.1	.07	41.5	.05

Bank Sta: Left Right Coeff Contr. Expan.

-8.61	17.1	.3	.5
-------	------	----	----

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-214	-8.6	16.7	F
9.6	340	16.7	F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical

Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98

Elevation at which weir flow begins = 16.7

Energy head used in spillway design =

Spillway height used in design =

Weir crest shape = Broad Crested

Number of Piers = 1

Pier Data

Pier Station Upstream= 0 Downstream= 0

Upstream num= 2

Width	Elev	Width	Elev
2	7	2	12.8

Downstream num= 2

Width	Elev	Width	Elev
2	7	2	12.8

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Pressure and Weir flow

Submerged Inlet Cd	=
Submerged Inlet + Outlet Cd	= .8
Max Low Cord	= 12.5

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Mill Brook

REACH: Main

RS: 115

INPUT

Description: Downstream face of Mystic Street Bridge

Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-214	20	-173	19	-114.5	18	-64.5	17	-35	16
-8.61	15.7	-8.6	7.8	-3.8	8.2	-1	8.3	0	8
1	8.7	5.9	8.7	8.8	8.9	17.1	13	23.5	16.25
41.5	16.7	91.5	17	204	17.16	340	19		

Manning's n Values

num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-214	.06	-8.61	.02	-8.6	.04	17.1	.07	41.5	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

-8.61 17.1 45 40 30 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-214	-8.6	16.7	F
9.6	340	16.7	F

CROSS SECTION

RIVER: Mill Brook

REACH: Main

RS: 75

INPUT

Description: 40 Downstream of Mystic St. Bridge

Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-5.31	20	-5.3	11	-5.3	8.97	0	8.53	6.7	8.76
8.8	11	13	15.27	30	16	30	20		

Manning's n Values

num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-5.31	.02	-5.3	.04	8.8	.07	13	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

-5.3 8.8 75 75 74 .1 .3

CROSS SECTION

RIVER: Mill Brook

REACH: Main

RS: 0

INPUT

Description: Downstream End of Model (FEMA Cross-Section E)

Station	Elevation	Data num=	9
Sta -6.1	Elev 20	Sta -6	Elev 10
Sta 8.6	Elev 10	Sta 13.3	Elev 13.78
		Sta 21.4	Elev 14
		Sta 21.4	Elev 22.5
		Sta 7	Elev 8.71

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-6.1	.02	-6	.04	8.6	.07	13.3	.05

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	-6	8.6		0	0	0		.1	.3

SUMMARY OF MANNING'S N VALUES

River: Mill Brook

Reach	River Sta.	n1	n2	n3	n4	n5
Main	458	.06	.045	.07		
Main	384	.06	.045	.07		
Main	309	.06	.045	.06		
Main	244	.06	.045	.02	.06	
Main	179	.06	.02	.045	.02	.06
Main	140	Bridge				
Main	115	.06	.02	.04	.07	.05
Main	75	.02	.04	.07	.05	
Main	0	.02	.04	.07	.05	

SUMMARY OF REACH LENGTHS

River: Mill Brook

Reach	River Sta.	Left	Channel	Right
Main	458	77	74	70
Main	384	67	74	78
Main	309	66	65	65
Main	244	66	66	66
Main	179	63	63	66
Main	140	Bridge		
Main	115	45	40	30
Main	75	75	75	74
Main	0	0	0	0

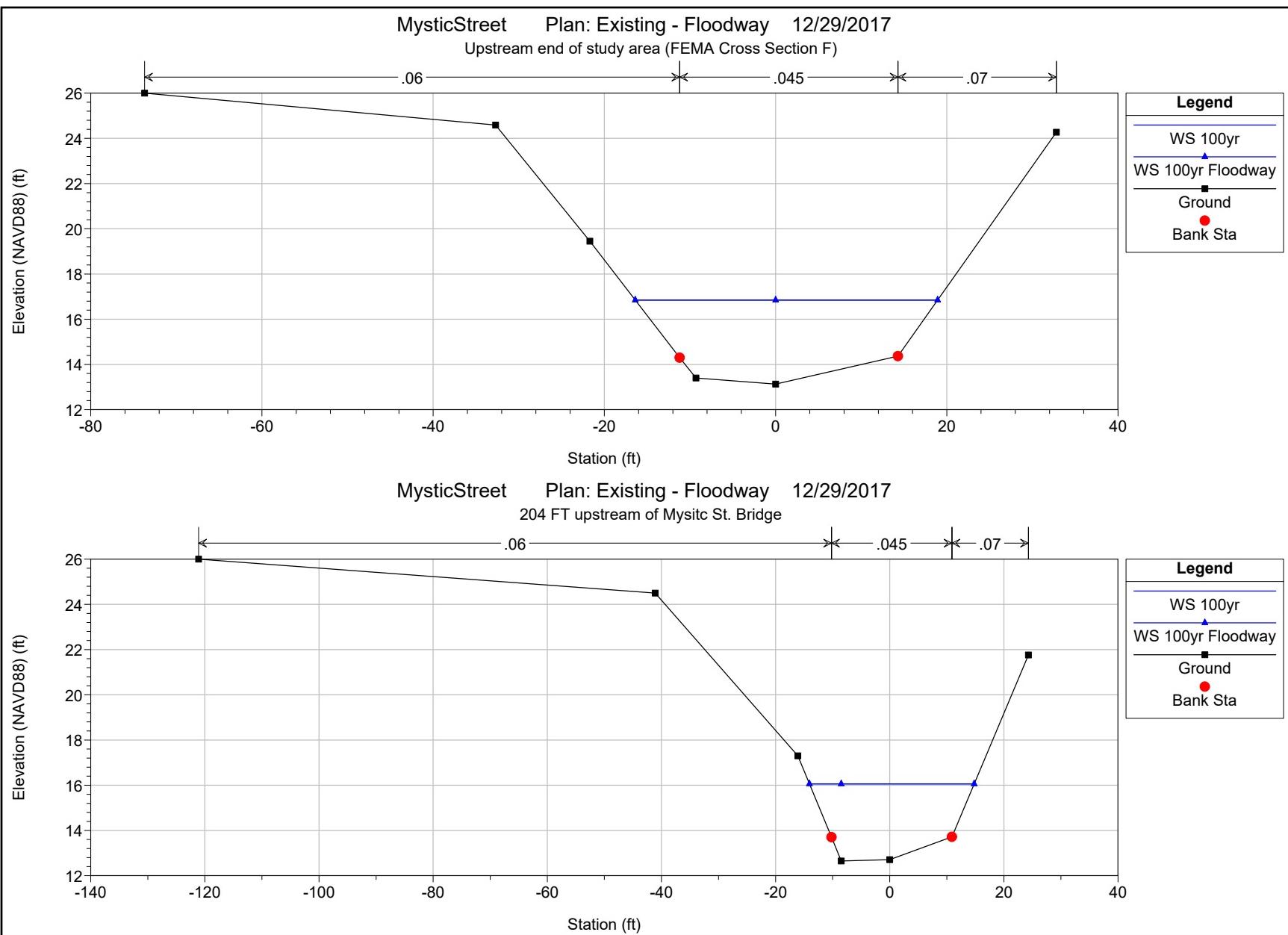
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

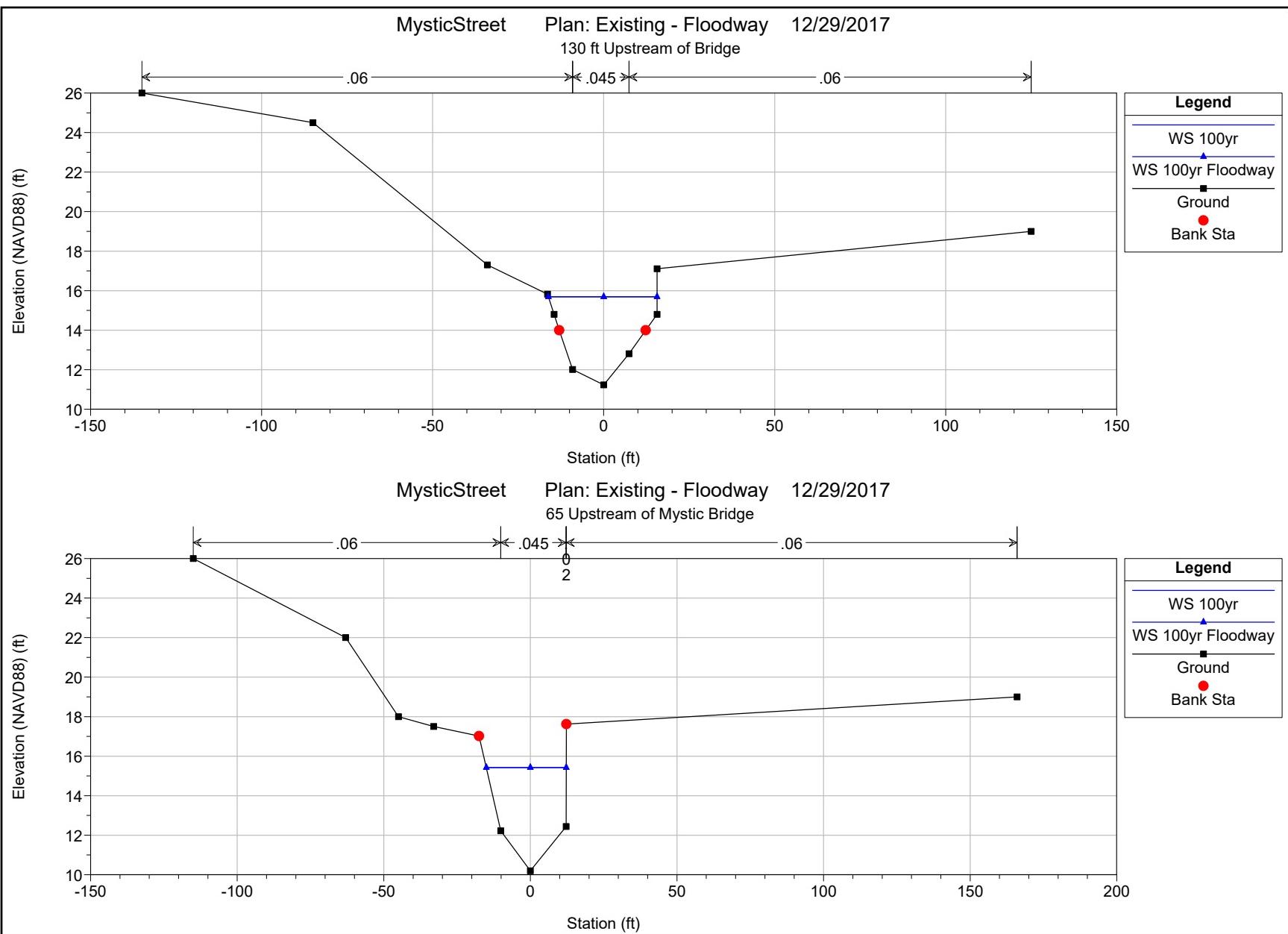
River: Mill Brook

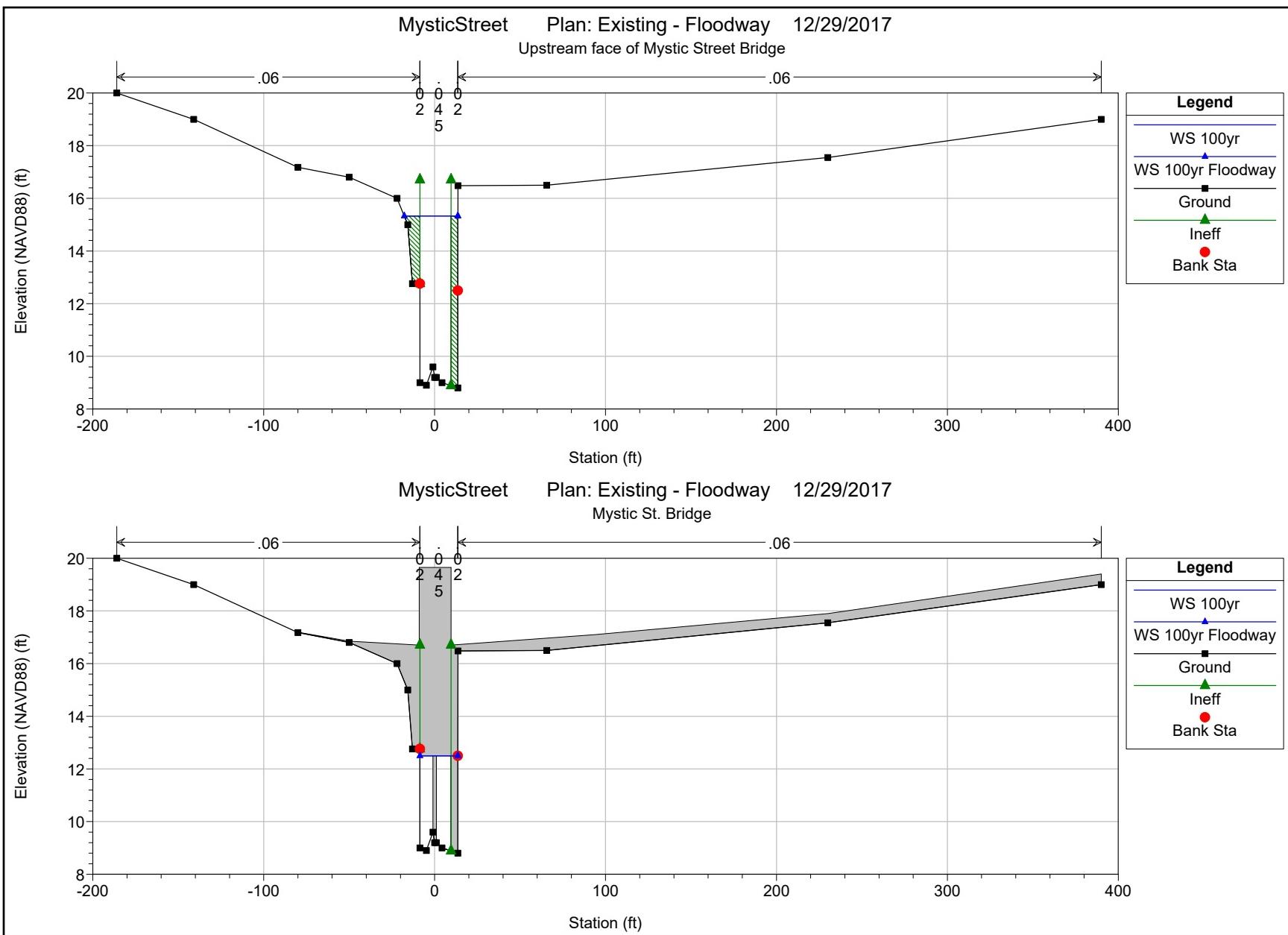
Reach	River Sta.	Contr.	Expan.
Main	458	.1	.3
Main	384	.1	.3
Main	309	.1	.3
Main	244	.1	.3
Main	179	.3	.5
Main	140	Bridge	
Main	115	.3	.5
Main	75	.1	.3
Main	0	.1	.3

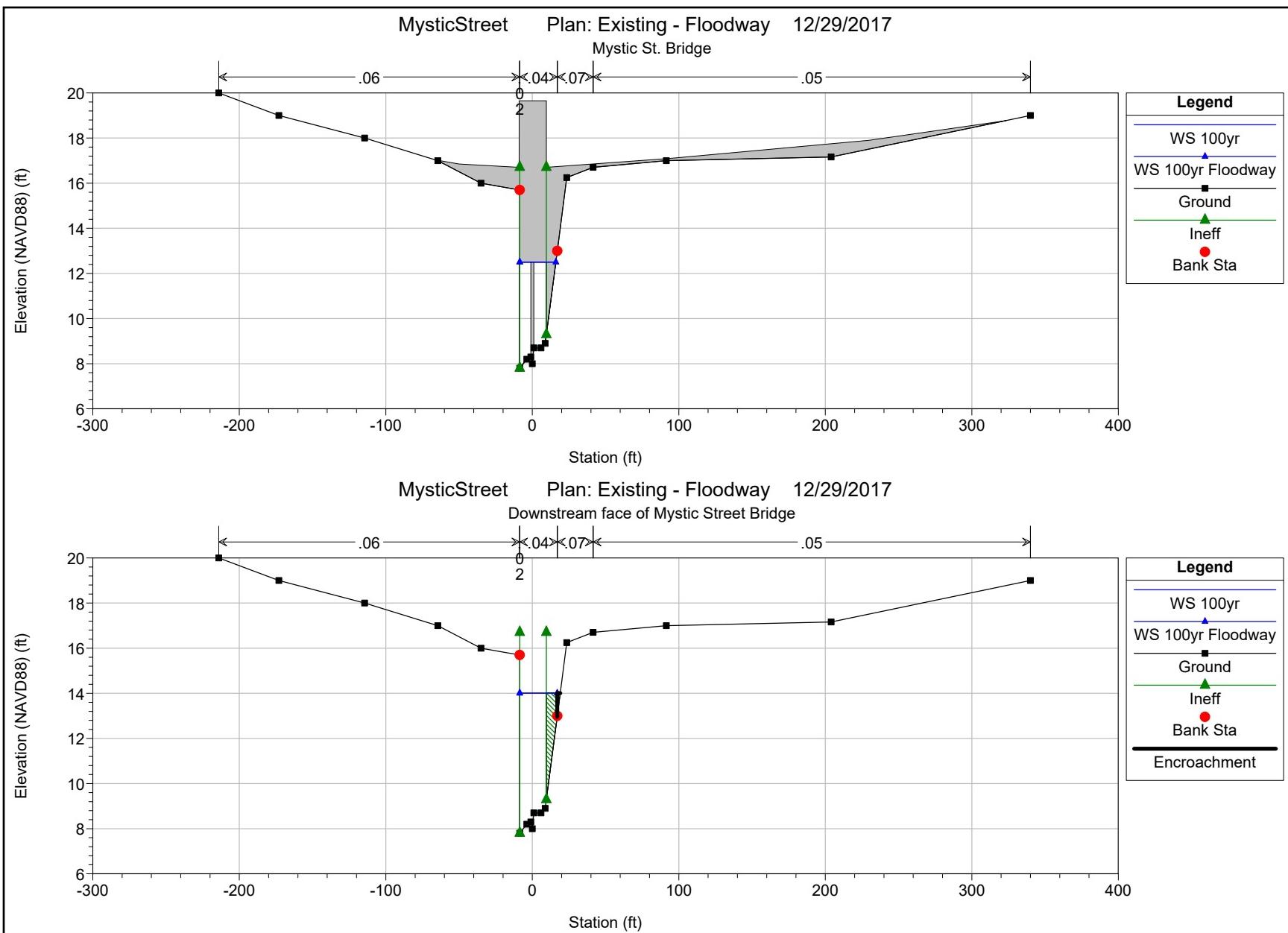
HEC-RAS Plan: Exist-Fldway River: Mill Brook Reach: Main

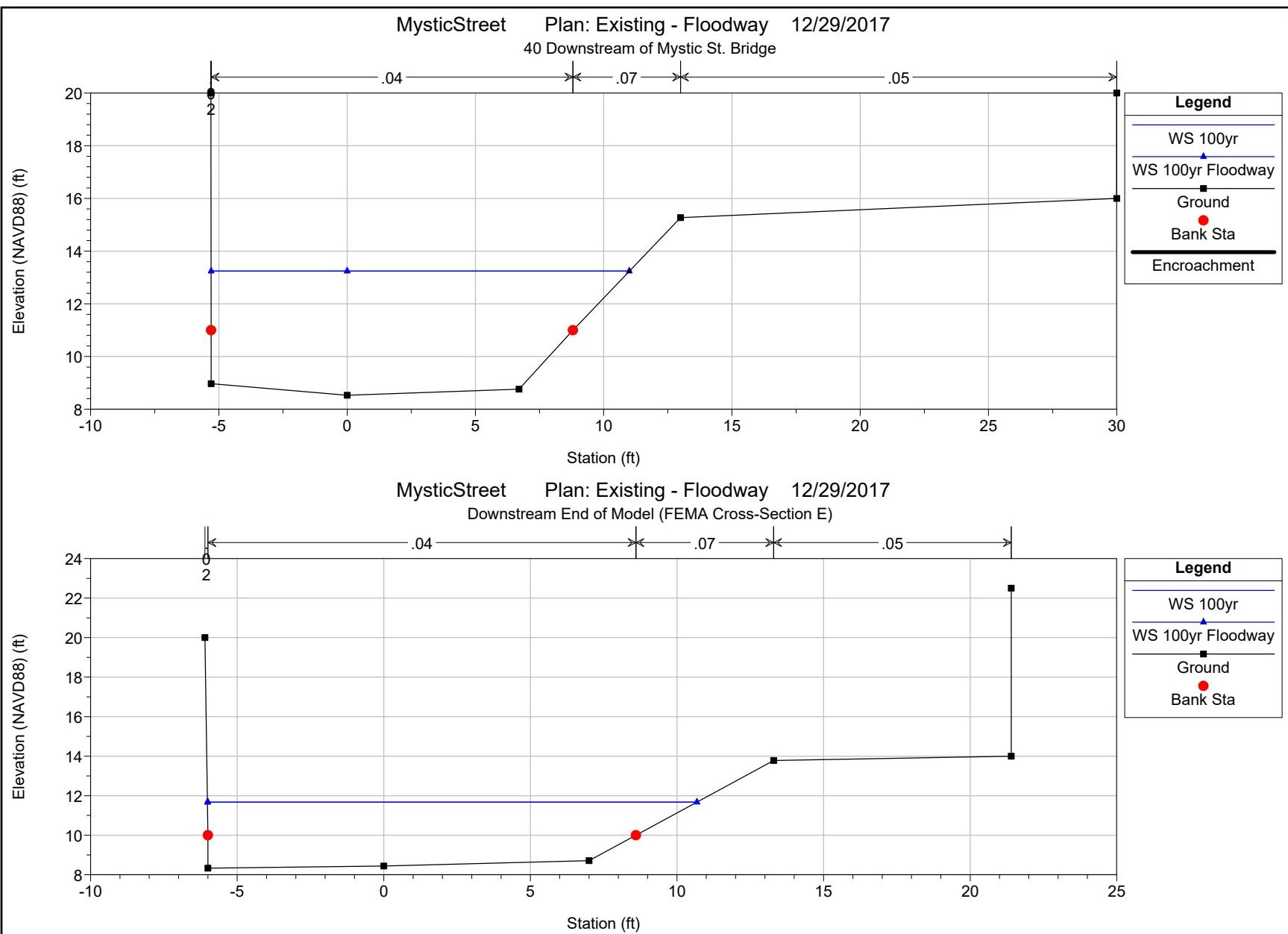
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	0	100yr	450.00	8.33	11.67	11.67	13.18	0.018836	9.88	46.91	16.70	0.99
Main	0	100yr Floodway	450.00	8.33	11.67	11.67	13.18	0.018836	9.88	46.91	16.70	0.99
Main	75	100yr	450.00	8.53	13.24	12.03	14.05	0.006866	7.23	64.17	16.31	0.61
Main	75	100yr Floodway	450.00	8.53	13.24	12.03	14.05	0.006869	7.24	64.16	16.30	0.61
Main	115	100yr	450.00	7.80	14.01	11.10	14.31	0.001482	4.43	101.47	27.69	0.33
Main	115	100yr Floodway	450.00	7.80	14.01	11.10	14.31	0.001482	4.44	101.46	25.61	0.33
Main	140	Bridge										
Main	179	100yr	450.00	8.80	15.33	11.74	15.58	0.001360	3.95	113.83	31.39	0.28
Main	179	100yr Floodway	450.00	8.80	15.33	11.74	15.58	0.001361	3.95	113.82	31.39	0.28
Main	244	100yr	450.00	10.20	15.43		15.74	0.004084	4.47	100.68	27.30	0.41
Main	244	100yr Floodway	450.00	10.20	15.43		15.74	0.004085	4.47	100.67	27.30	0.41
Main	309	100yr	450.00	11.23	15.69		16.08	0.006173	5.09	92.80	31.76	0.49
Main	309	100yr Floodway	450.00	11.23	15.69		16.08	0.006174	5.09	92.80	31.76	0.49
Main	384	100yr	450.00	12.65	16.06		16.72	0.009313	6.65	73.75	28.87	0.67
Main	384	100yr Floodway	450.00	12.65	16.06		16.72	0.009314	6.65	73.75	28.86	0.67
Main	458	100yr	450.00	13.13	16.85		17.24	0.005056	5.14	95.71	35.33	0.50
Main	458	100yr Floodway	450.00	13.13	16.85		17.24	0.005056	5.14	95.71	35.33	0.50











APPENDIX E

Proposed Conditions

Proposed Conditions -Design Flows

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

X	X	XXXXXX	XXXX	XXXX	XX	XXXX
X	X	X	X X	X X	X X	X
X	X	X	X	X X	X X	X
XXXXXX	XXXX	X	XXX	XXXX	XXXXXX	XXXX
X	X	X	X	X X	X X	X
X	X	X	X X	X X	X X	X
X	X	XXXXXX	XXXX	X X	X X	XXXXX

PROJECT DATA

Project Title: MysticStreet
Project File : MysticStreet.prj
Run Date and Time: 12/29/2017 1:16:50 PM

Project in English units

Project Description:

Project: Mystic Street Bridge Replacement in Arlington, MA
Done by: LEC and
RSV
Datum: NAVD88

PLAN DATA

Plan Title: Proposed - Floodway
Plan File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.p02

Geometry Title: Proposed
Geometry File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.g03

Flow Title : FEMA Floodway Flows
Flow File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.f02

Plan Description:

Proposed conditions with FEMA Flows

Plan Summary Information:

Number of: Cross Sections =	8	Multiple Openings =	0
Culverts =	0	Inline Structures =	0
Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3

Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary

Conveyance Calculation Method: At breaks in n values only

Friction Slope Method: Average Conveyance

Computational Flow Regime: Subcritical Flow

Encroachment Data

Equal Conveyance = True

Left Offset = 0

Right Offset = 0

River = Mill Brook Reach = Main

RS	Profile	Method	Value1	Value2
458	100yr Floodway	1	-17	22
384	100yr Floodway	1	-36	24
309	100yr Floodway	1	-38	48
244	100yr Floodway	1	-25	35
179	100yr Floodway	1	-45	25
115	100yr Floodway	1	-25	17
75	100yr Floodway	1	-25	11
0	100yr Floodway	1	-45	18

FLOW DATA

Flow Title: FEMA Floodway Flows

Flow File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.f02

Flow Data (cfs)

River	Reach	RS	100yr	100yr Floodway
Mill Brook	Main	458	450	450

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
Mill Brook	Main	100yr	Normal S = 0.063
Known WS = 10.8			
Mill Brook	Main	100yr Floodway	Normal S = 0.063
Known WS = 10.9			

GEOMETRY DATA

Geometry Title: Proposed

Geometry File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 11.06.17\MysticStreet.g03

CROSS SECTION

RIVER: Mill Brook

REACH: Main

RS: 458

INPUT

Description: Upstream end of study area (FEMA Cross Section F)

Station Elevation Data num= 8			
Sta	Elev	Sta	Elev
-73.7	26	-32.7	24.59
0	13.13	14.3	14.37
			-21.7
			19.45
			-11.2
			14.3
			-9.3
			13.4
			24.27

Manning's n Values

num= 3			
Sta	n Val	Sta	n Val
-73.7	.06	-11.2	.04
			14.3
			.07

Bank Sta: Left Right		Lengths: Left Channel Right			Coeff Contr.	Expan.
-11.2	14.3	77	74	70	.1	.3

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 384

INPUT

Description: 204 FT upstream of Mysitc St. Bridge

Station Elevation Data num= 8			
Sta	Elev	Sta	Elev
-121.1	26	-41.1	24.5
0	12.71	10.9	13.72
			-16.1
			17.3
			-10.2
			13.7
			-8.5
			12.65
			21.76

Manning's n Values

num= 3			
Sta	n Val	Sta	n Val
-121.1	.06	-10.2	.045
			10.9
			.07

Bank Sta: Left Right		Lengths: Left Channel Right			Coeff Contr.	Expan.
-10.2	10.9	67	74	78	.1	.3

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 309

INPUT

Description: 130 ft Upstream of Bridge

Station Elevation Data num= 13			
Sta	Elev	Sta	Elev
-135	26	-85	24.5
-13	14	-9.1	12.01
15.6	14.8	15.61	17.11
			-34
			17.3
			-16.4
			15.82
			-14.5
			14.8
			12.81
			12.3
			14
			19

Manning's n Values

num= 3			
Sta	n Val	Sta	n Val
-135	.06	-9.1	.045
			7.4
			.06

Bank Sta: Left Right		Lengths: Left Channel Right			Coeff Contr.	Expan.
-13	12.3	66	65	65	.1	.3

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 244

INPUT

Description: 65 Upstream of Mystic Bridge

Station Elevation Data num= 10			
Sta	Elev	Sta	Elev
-115	26	-63	22
-10.1	12.22	0	10.2
			12.2
			12.44
			12.3
			17.62
			166
			19

Manning's n Values num= 4			
Sta	n Val	Sta	n Val
-115	.06	-10.1	.045
			12.2
			.02
			12.3
			.06

Bank Sta: Left Right		Lengths: Left Channel		Right	Coeff Contr.	Expan.
-17.5	12.3	66	66	66	.1	.3

CROSS SECTION

RIVER: Mill Brook
REACH: Main RS: 179

INPUT

Description: Upstream face of Mystic Street Bridge

Station Elevation Data num= 21			
Sta	Elev	Sta	Elev
-186	20	-141	19
-15.7	15	-13.91	12.89
-10.24	8.6	7.96	8.6
14.45	12.89	14.46	16.48
390	19		
			15
			16.48
			65.6
			16.5
			230
			17.55

Manning's n Values num= 5			
Sta	n Val	Sta	n Val
-186	.06	-13.91	.02
			-13.9
			.045
			14.45
			.02
			14.46
			.06

Bank Sta: Left Right		Lengths: Left Channel		Right	Coeff Contr.	Expan.
-13.91	14.45	63	63	66	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-186	-13.91	16.92	F
14.45	390	16.92	F

BRIDGE

RIVER: Mill Brook
REACH: Main RS: 140

INPUT

Description: Mystic St. Bridge

Distance from Upstream XS = .5

Deck/Roadway Width = 62

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 16				
Sta	Hi	Cord	Lo	Cord
-107	17.5	0	-50	17
-13.9	16.93	12.89	-9	16.92
-8.6	19.65	12.89	-8.6	19.65
9.6	19.65	12.89	9.6	16.92
14.9	16.93	0	94	17.1
390	19.4			0
				230
				17.9

Upstream Bridge Cross Section Data
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-186	20	-141	19	-80	17.18	-50	16.8	-22	16
-15.7	15	-13.91	12.89	-13.9	9.89	-12.9	9.89	-10.24	8.63
-10.24	8.6	7.96	8.6	7.96	8.63	10.62	9.89	14.45	9.89
14.45	12.89	14.46	16.48	15	16.48	65.6	16.5	230	17.55
390	19								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-186	.06	-13.91	.02	-13.9	.045	14.45	.02	14.46	.06

Bank Sta: Left Right Coeff Contr. Expan.
 -13.91 14.45 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-186	-13.91	16.92	F
14.45	390	16.92	F

Downstream Deck/Roadway Coordinates

num= 16									
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-107	17.5	0	-50	17	0	-13.9	16.93	0	
-13.9	16.93	12.89	-9	16.92	12.89	-9	19.65	12.89	
-8.6	19.65	12.89	-8.6	19.65	12.89	0	19.65	12.89	
9.6	19.65	12.89	9.6	16.92	12.89	14.9	16.93	12.89	
14.9	16.93	0	94	17.1	0	230	17.9		
390	19.4								

Downstream Bridge Cross Section Data

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-214	20	-173	19	-114.5	18	-64.5	17	-35	16
-14	14	-13.9	12.89	-13.9	9.89	-12.9	9.89	-10.24	8.63
-10.24	8.5	7.96	8.5	7.96	8.63	10.62	9.89	14.45	9.89
14.45	12.89	14.46	15	17.1	15	23.5	16.25	41.5	16.7
91.5	17	204	17.16	340	19				

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-214	.06	-14	.02	-13.9	.045	14.45	.02	14.46	.07
41.5	.05								

Bank Sta: Left Right Coeff Contr. Expan.
 -13.9 14.46 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-214	-13.9	16.92	F
14.45	340	16.92	F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical

Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98

Elevation at which weir flow begins = 16.92

Energy head used in spillway design =

Spillway height used in design =

Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Pressure and Weir flow

Submerged Inlet Cd	=
Submerged Inlet + Outlet Cd	= .8
Max Low Cord	=

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 115

INPUT

Description: Downstream face of Mystic Street Bridge

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-214	20	-173	19	-114.5	18	-64.5	17	-35	16
-14	14	-13.9	12.89	-13.9	9.89	-12.9	9.89	-10.24	8.63
-10.24	8.5	7.96	8.5	7.96	8.63	10.62	9.89	14.45	9.89
14.45	12.89	14.46	15	17.1	15	23.5	16.25	41.5	16.7
91.5	17	204	17.16	340	19				

Manning's n Values

num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-214	.06	-14	.02	-13.9	.045	14.45	.02	14.46	.07
41.5	.05								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-13.9 14.46 45 40 30 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-214	-13.9	16.92	F
14.45	340	16.92	F

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 75

INPUT

Description: 40 Downstream of Mystic St. Bridge

Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-5.31	20	-5.3	11	-5.3	8.97	0	8.53	6.7	8.76
8.8	11	13	15.27	30	16	30	20		

Manning's n Values

num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-5.31	.02	-5.3	.04	8.8	.07	13	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-5.3 8.8 75 75 74 .1 .3

CROSS SECTION

RIVER: Mill Brook

REACH: Main

RS: 0

INPUT

Description: Downstream End of Model (FEMA Cross-Section E)

Station	Elevation	Data	num=	9	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-6.1	20	-6	10	-6	8.33	0	8.44	7	8.71			
8.6	10	13.3	13.78	21.4	14	21.4	22.5					

Manning's n Values

num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-6.1	.02	-6	.04	8.6	.07	13.3	.05

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	-6	8.6		0	0	0	.1		.3

SUMMARY OF MANNING'S N VALUES

River: Mill Brook

Reach	River Sta.	n1	n2	n3	n4	n5
Main	458	.06	.04	.07		
Main	384	.06	.045	.07		
Main	309	.06	.045	.06		
Main	244	.06	.045	.02	.06	
Main	179	.06	.02	.045	.02	.06
Main	140	Bridge				
Main	115	.06	.02	.045	.02	.07
.05						
Main	75	.02	.04	.07	.05	
Main	0	.02	.04	.07	.05	

SUMMARY OF REACH LENGTHS

River: Mill Brook

Reach	River Sta.	Left	Channel	Right
Main	458	77	74	70
Main	384	67	74	78
Main	309	66	65	65
Main	244	66	66	66
Main	179	63	63	66
Main	140	Bridge		
Main	115	45	40	30
Main	75	75	75	74
Main	0	0	0	0

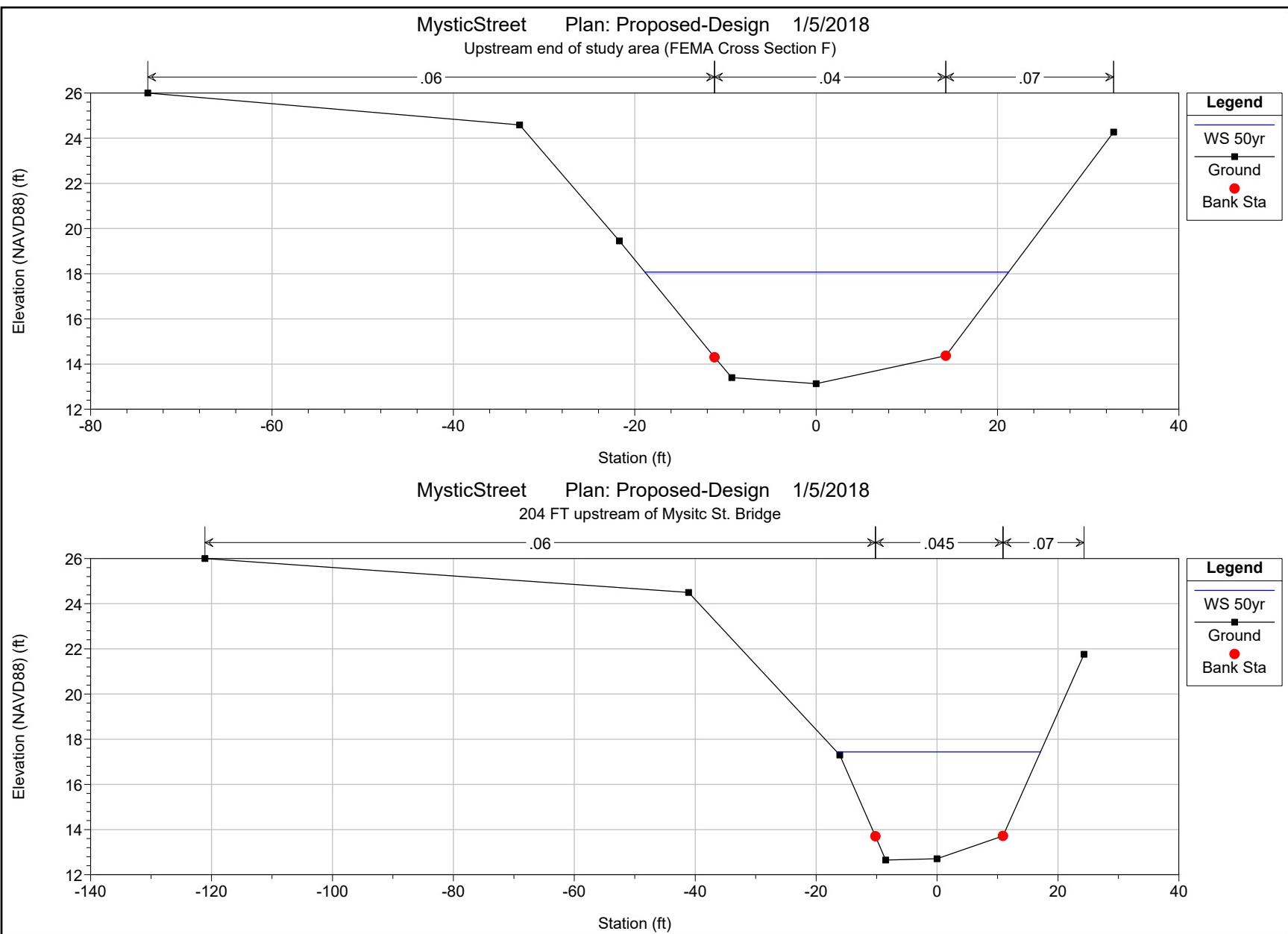
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

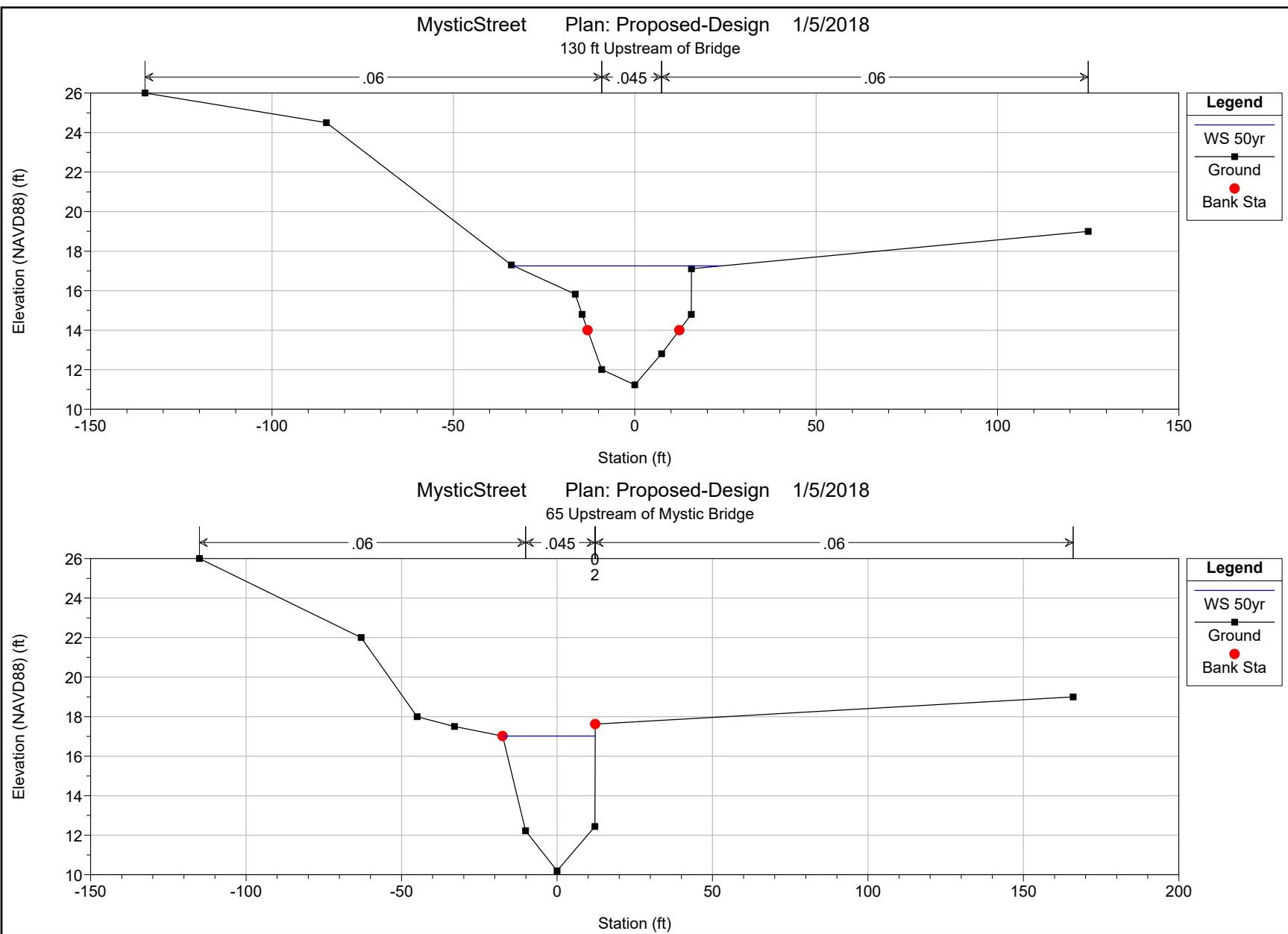
River: Mill Brook

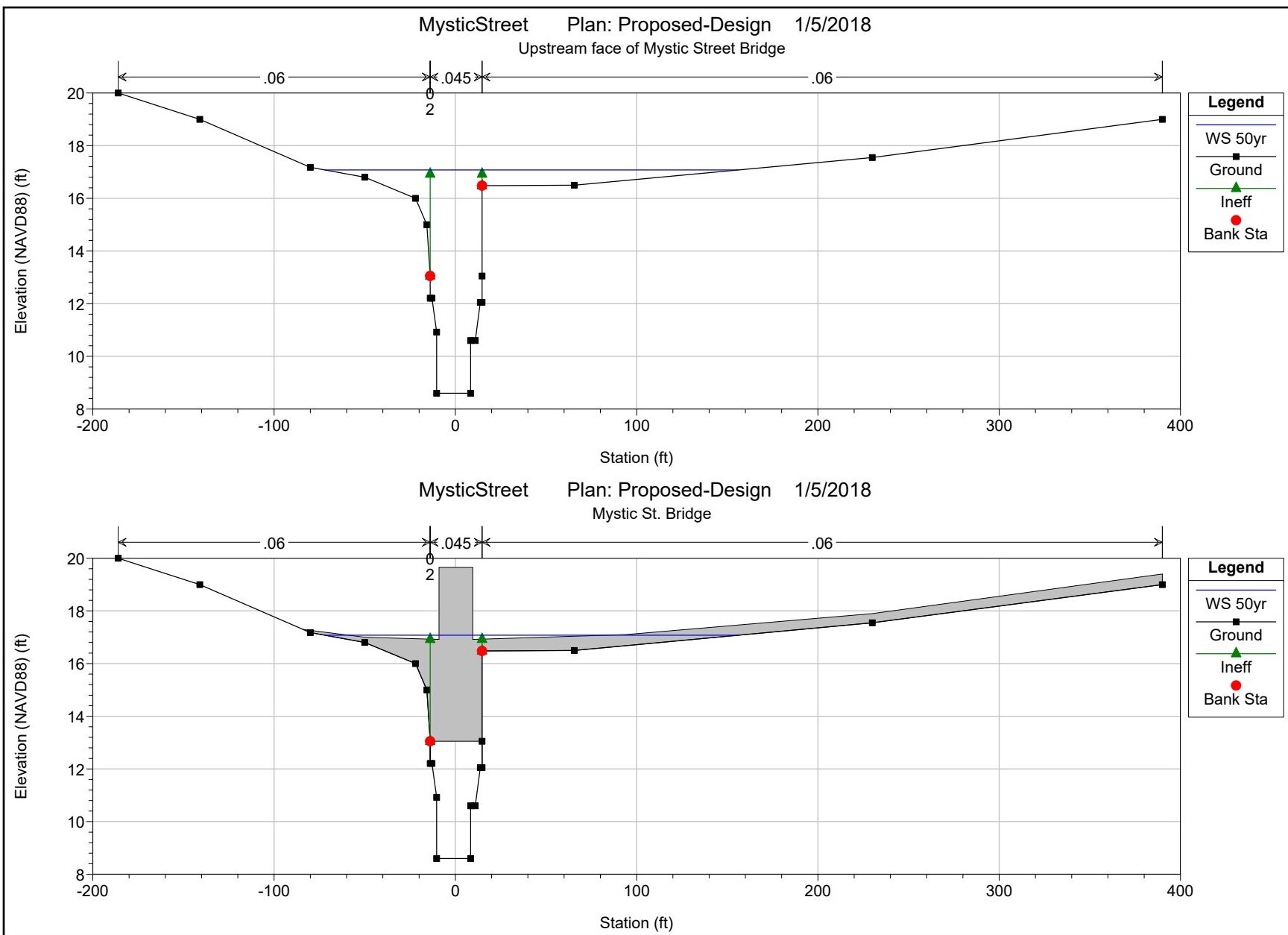
Reach	River Sta.	Contr.	Expan.
Main	458	.1	.3
Main	384	.1	.3
Main	309	.1	.3
Main	244	.1	.3
Main	179	.3	.5
Main	140	Bridge	
Main	115	.3	.5
Main	75	.1	.3
Main	0	.1	.3

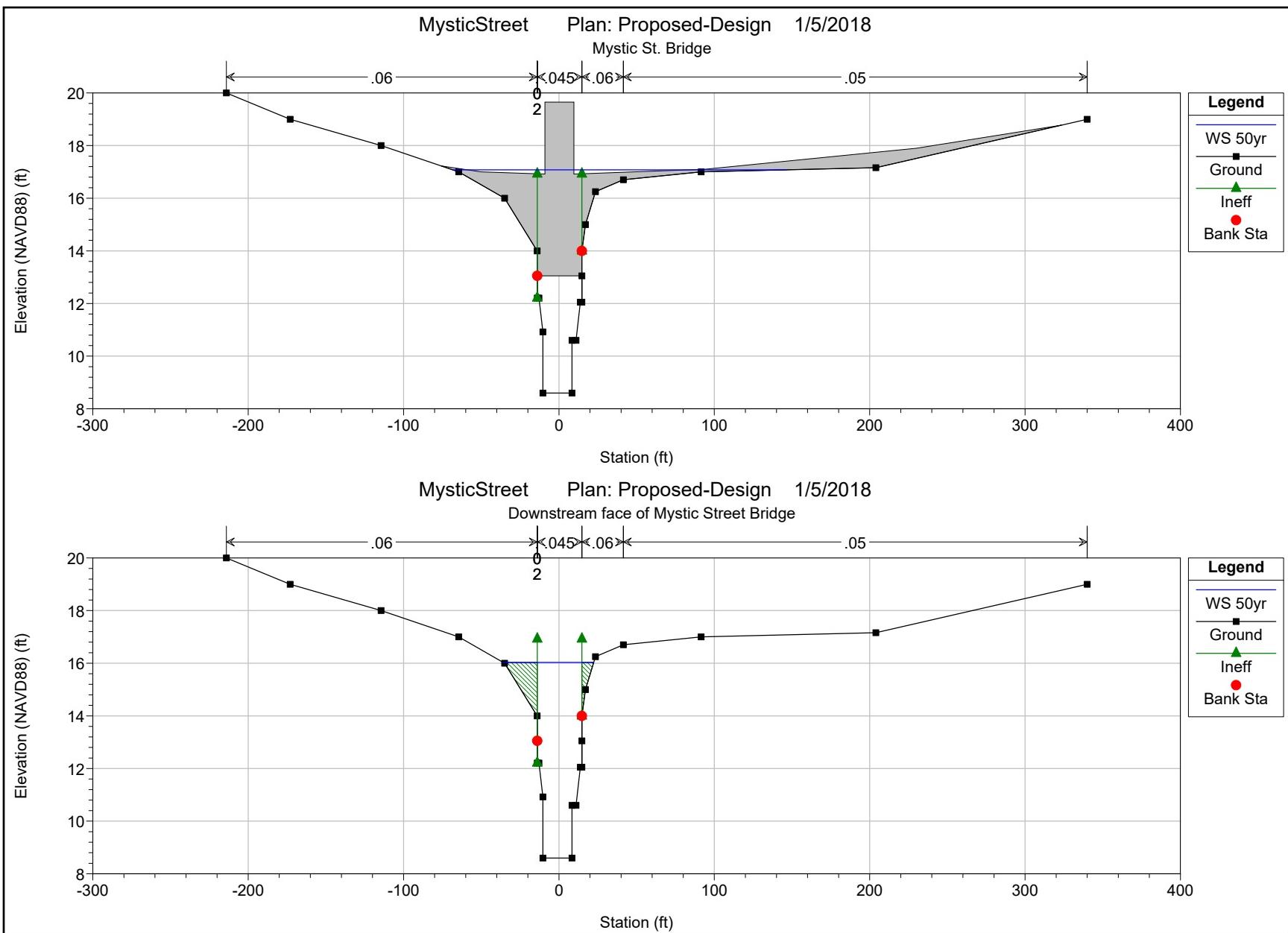
HEC-RAS Plan: Prop-Des River: Mill Brook Reach: Main

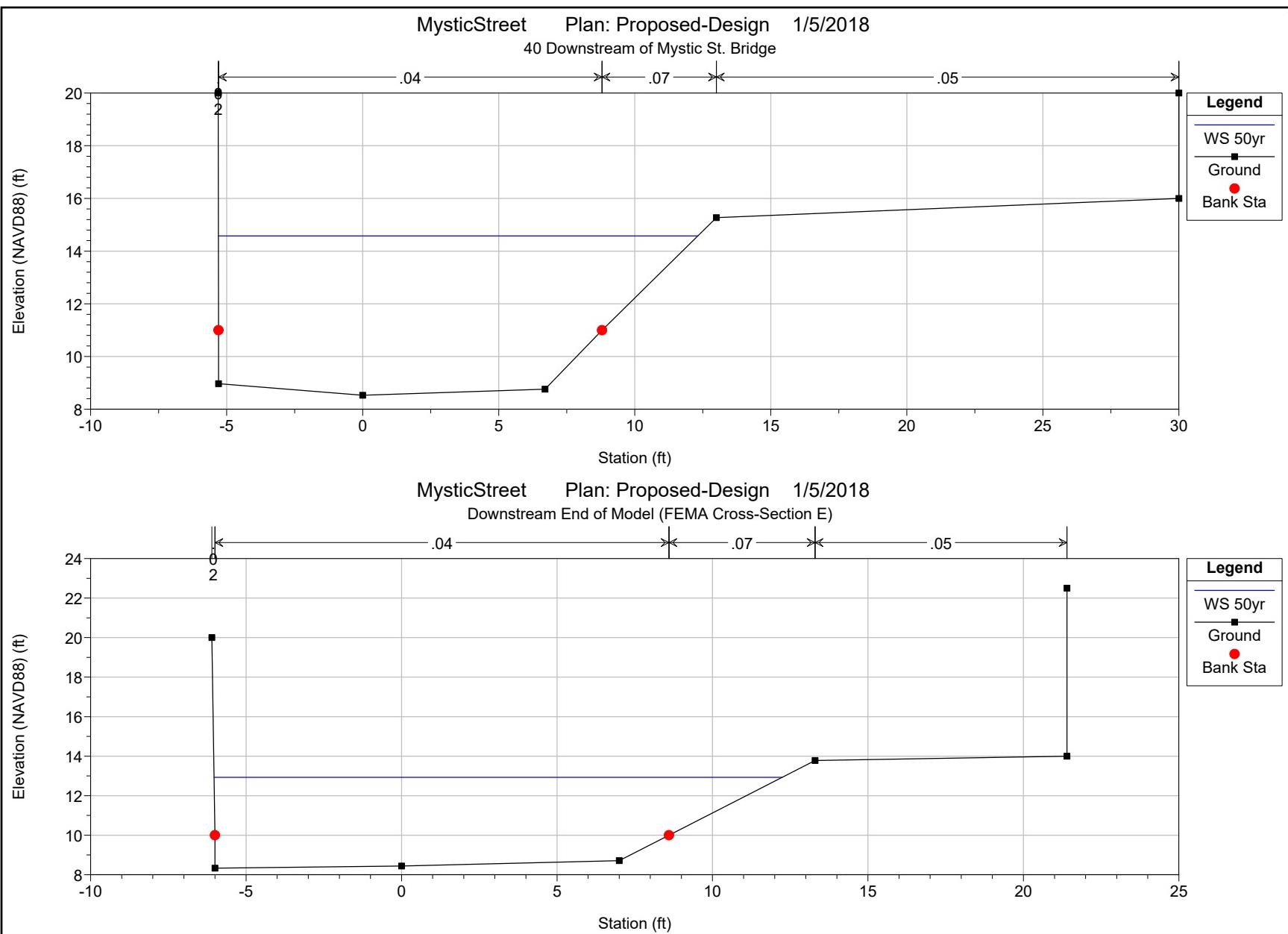
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	0	2yr	201.00	8.33	10.38	10.38	11.29	0.023142	7.64	26.39	15.08	1.00
Main	0	5yr	338.00	8.33	11.14	11.14	12.40	0.020235	9.02	38.13	16.03	0.99
Main	0	10yr	449.00	8.33	11.67	11.67	13.17	0.018853	9.88	46.83	16.69	0.99
Main	0	25yr	612.00	8.33	12.37	12.37	14.19	0.017419	10.89	58.89	17.58	0.99
Main	0	50yr	750.00	8.33	12.93	12.93	14.97	0.016368	11.56	68.88	18.27	0.98
Main	0	100yr	904.00	8.33	13.45	13.45	15.77	0.016138	12.38	78.53	18.92	0.99
Main	0	200yr	1075.00	8.33	14.34	14.34	16.55	0.012526	12.20	99.37	27.44	0.90
Main	0	500yr	1207.00	8.33	14.77	14.77	17.07	0.012053	12.55	111.03	27.45	0.89
Main	75	2yr	201.00	8.53	11.73	10.69	12.11	0.005745	4.98	40.57	14.82	0.52
Main	75	5yr	338.00	8.53	12.63		13.25	0.006464	6.35	54.33	15.70	0.58
Main	75	10yr	449.00	8.53	13.24	12.02	14.04	0.006865	7.23	64.08	16.30	0.61
Main	75	25yr	612.00	8.53	14.01	12.76	15.07	0.007340	8.33	76.94	17.06	0.65
Main	75	50yr	750.00	8.53	14.58	13.34	15.85	0.007701	9.15	86.79	17.62	0.67
Main	75	100yr	904.00	8.53	15.18	13.92	16.67	0.007938	9.93	97.54	18.21	0.70
Main	75	200yr	1075.00	8.53	15.51	14.54	17.40	0.009376	11.17	104.31	23.90	0.76
Main	75	500yr	1207.00	8.53	15.71	15.00	17.93	0.010603	12.12	109.64	28.63	0.82
Main	115	2yr	201.00	8.60	12.22	10.12	12.33	0.002142	2.63	76.39	28.66	0.28
Main	115	5yr	338.00	8.60	13.37	10.84	13.52	0.001910	3.09	109.46	28.70	0.28
Main	115	10yr	449.00	8.60	14.18	11.28	14.36	0.001823	3.39	132.55	31.07	0.28
Main	115	25yr	612.00	8.60	15.23	11.86	15.45	0.001713	3.76	162.63	45.18	0.28
Main	115	50yr	750.00	8.60	16.03	12.32	16.29	0.001655	4.04	185.63	58.32	0.28
Main	115	100yr	904.00	8.60	16.87	12.70	17.16	0.001603	4.31	209.64	130.43	0.28
Main	115	200yr	1075.00	8.60	17.86	13.08	18.00	0.000858	3.42	560.89	363.34	0.21
Main	115	500yr	1207.00	8.60	18.54	13.36	18.62	0.000548	2.88	836.29	451.74	0.17
Main	140	Bridge										
Main	179	2yr	201.00	8.60	12.36	10.13	12.45	0.001824	2.50	80.33	28.66	0.26
Main	179	5yr	338.00	8.60	13.51	10.84	13.65	0.001727	2.98	113.31	29.09	0.26
Main	179	10yr	449.00	8.60	14.51	11.28	14.67	0.001491	3.16	141.98	30.01	0.25
Main	179	25yr	612.00	8.60	15.96	11.86	16.13	0.001239	3.33	183.59	36.50	0.23
Main	179	50yr	750.00	8.60	17.08	12.32	17.24	0.000979	3.27	309.29	228.19	0.21
Main	179	100yr	904.00	8.60	17.59	12.70	17.74	0.000930	3.33	451.48	327.52	0.21
Main	179	200yr	1075.00	8.60	18.03	13.08	18.17	0.000856	3.31	611.88	391.69	0.20
Main	179	500yr	1207.00	8.60	18.55	13.35	18.65	0.000643	2.99	835.68	466.71	0.18
Main	244	2yr	201.00	10.20	12.62	12.62	13.31	0.029379	6.63	30.31	22.93	1.02
Main	244	5yr	338.00	10.20	13.31	13.20	14.13	0.022537	7.28	46.40	24.00	0.92
Main	244	10yr	449.00	10.20	14.42		14.99	0.009880	6.06	74.08	25.73	0.63
Main	244	25yr	612.00	10.20	15.92		16.36	0.005266	5.36	114.27	28.07	0.47
Main	244	50yr	750.00	10.20	17.02		17.43	0.003961	5.13	146.10	29.78	0.41
Main	244	100yr	904.00	10.20	17.46		17.95	0.004331	5.67	162.20	43.84	0.43
Main	244	200yr	1075.00	10.20	17.81		18.42	0.004875	6.27	181.46	74.00	0.46
Main	244	500yr	1207.00	10.20	18.30		18.88	0.004363	6.27	232.62	134.06	0.44
Main	309	2yr	201.00	11.23	14.11		14.41	0.010445	4.37	46.03	25.98	0.57
Main	309	5yr	338.00	11.23	14.71		15.18	0.011318	5.50	62.63	29.57	0.62
Main	309	10yr	449.00	11.23	15.11		15.70	0.011813	6.22	74.65	30.68	0.65
Main	309	25yr	612.00	11.23	16.25		16.77	0.006733	5.89	111.78	37.11	0.52
Main	309	50yr	750.00	11.23	17.26		17.72	0.004513	5.61	155.77	57.52	0.44
Main	309	100yr	904.00	11.23	17.74		18.24	0.004489	5.95	191.17	89.07	0.45
Main	309	200yr	1075.00	11.23	18.21		18.72	0.004296	6.15	240.59	119.81	0.45
Main	309	500yr	1207.00	11.23	18.71		19.15	0.003545	5.90	308.61	152.29	0.41
Main	384	2yr	201.00	12.65	14.83		15.23	0.010919	5.11	40.78	24.80	0.67
Main	384	5yr	338.00	12.65	15.45		16.06	0.011320	6.33	56.85	26.86	0.71
Main	384	10yr	449.00	12.65	15.86		16.62	0.011717	7.13	68.08	28.21	0.74
Main	384	25yr	612.00	12.65	16.62		17.45	0.009551	7.53	90.43	30.72	0.70
Main	384	50yr	750.00	12.65	17.44		18.22	0.006963	7.37	116.73	33.68	0.62
Main	384	100yr	904.00	12.65	17.86		18.78	0.007316	8.02	131.44	35.85	0.64
Main	384	200yr	1075.00	12.65	18.22		19.32	0.007984	8.79	144.75	37.71	0.68
Main	384	500yr	1207.00	12.65	18.57		19.75	0.007965	9.16	158.10	39.49	0.68
Main	458	2yr	201.00	13.13	15.52	14.82	15.77	0.004878	4.01	52.19	30.13	0.51
Main	458	5yr	338.00	13.13	16.24	15.34	16.59	0.004654	4.83	74.96	32.95	0.52
Main	458	10yr	449.00	13.13	16.74	15.70	17.17	0.004534	5.35	91.82	34.90	0.53
Main	458	25yr	612.00	13.13	17.43	16.19	17.94	0.004222	5.89	116.77	37.59	0.53
Main	458	50yr	750.00	13.13	18.07	16.55	18.61	0.003656	6.08	141.95	40.12	0.51
Main	458	100yr	904.00	13.13	18.58	16.93	19.19	0.003642	6.51	162.56	42.08	0.51
Main	458	200yr	1075.00	13.13	19.06	17.32	19.75	0.003705	6.98	183.22	43.96	0.53
Main	458	500yr	1207.00	13.13	19.44	17.62	20.18	0.003666	7.26	200.21	45.44	0.53











Proposed Conditions -FEMA Flows

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

X	X	XXXXXX	XXXX	XXXX	XX	XXXX
X	X	X	X X	X X	X X	X
X	X	X	X	X X	X X	X
XXXXXX	XXXX	X	XXX	XXXX	XXXXXX	XXXX
X	X	X	X	X X	X X	X
X	X	X	X X	X X	X X	X
X	X	XXXXXX	XXXX	X X	X X	XXXXX

PROJECT DATA

Project Title: MysticStreet
Project File : MysticStreet.prj
Run Date and Time: 1/5/2018 2:14:45 PM

Project in English units

Project Description:

Project: Mystic Street Bridge Replacement in Arlington, MA
Done by: LEC and
RSV
Datum: NAVD88

PLAN DATA

Plan Title: Proposed-FEMA
Plan File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 01.02.18\MysticStreet.p07

Geometry Title: Proposed
Geometry File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 01.02.18\MysticStreet.g03

Flow Title : FEMA Flows
Flow File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 01.02.18\MysticStreet.f01

Plan Description:

Proposed conditions with FEMA Flows

Plan Summary Information:

Number of: Cross Sections =	8	Multiple Openings =	0
Culverts =	0	Inline Structures =	0
Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3

Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary

Conveyance Calculation Method: At breaks in n values only

Friction Slope Method: Average Conveyance

Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: FEMA Flows

Flow File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 01.02.18\MysticStreet.f01

Flow Data (cfs)

River	Reach	RS	10yr	50yr
100yr	500yr	200yr		
Mill Brook	Main	458	150	310
450	730	540		

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
Mill Brook	Main	10yr	Normal S = 0.063
Known WS = 10			
Mill Brook	Main	50yr	Normal S = 0.063
Known WS = 10.6			
Mill Brook	Main	100yr	Normal S = 0.063
Known WS = 10.8			
Mill Brook	Main	500yr	Normal S = 0.063
Known WS = 11.9			
Mill Brook	Main	200yr	Normal S = 0.063
Known WS = 11.5			

GEOMETRY DATA

Geometry Title: Proposed

Geometry File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 01.02.18\MysticStreet.g03

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 458

INPUT

Description: Upstream end of study area (FEMA Cross Section F)

Station	Elevation								
Sta	Elev								
-73.7	26	-32.7	24.59	-21.7	19.45	-11.2	14.3	-9.3	13.4
0	13.13	14.3	14.37	32.8	24.27				

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 -73.7 .06 -11.2 .04 14.3 .07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 -11.2 14.3 77 74 70 .1 .3

CROSS SECTION

RIVER: Mill Brook
 REACH: Main RS: 384

INPUT
 Description: 204 FT upstream of Mysitc St. Bridge
 Station Elevation Data num= 8
 Sta Elev Sta Elev Sta Elev Sta Elev
 -121.1 26 -41.1 24.5 -16.1 17.3 -10.2 13.7 -8.5 12.65
 0 12.71 10.9 13.72 24.3 21.76

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 -121.1 .06 -10.2 .045 10.9 .07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 -10.2 10.9 67 74 78 .1 .3

CROSS SECTION

RIVER: Mill Brook
 REACH: Main RS: 309

INPUT
 Description: 130 ft Upstream of Bridge
 Station Elevation Data num= 13
 Sta Elev Sta Elev Sta Elev Sta Elev
 -135 26 -85 24.5 -34 17.3 -16.4 15.82 -14.5 14.8
 -13 14 -9.1 12.01 0 11.23 7.4 12.81 12.3 14
 15.6 14.8 15.61 17.11 125 19

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 -135 .06 -9.1 .045 7.4 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 -13 12.3 66 65 65 .1 .3

CROSS SECTION

RIVER: Mill Brook
 REACH: Main RS: 244

INPUT
 Description: 65 Upstream of Mystic Bridge
 Station Elevation Data num= 10
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 -115 26 -63 22 -45 18 -33 17.5 -17.5 17.02
 -10.1 12.22 0 10.2 12.2 12.44 12.3 17.62 166 19

Manning's n Values num= 4
 Sta n Val Sta n Val Sta n Val Sta n Val

-115	.06	-10.1	.045	12.2	.02	12.3	.06
Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff Contr.
-17.5	12.3			66	66	66	.1 .3

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 179

INPUT

Description: Upstream face of Mystic Street Bridge

Station Elevation Data	num=	22							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-186	20	-141	19	-80	17.18	-50	16.8	-22	16
-15.7	15	-13.91	13.05	-13.9	12.21	-12.9	12.21	-10.32	10.92
-10.32	8.6	8.43	8.6	8.43	10.6	11.01	10.6	13.76	12.05
14.76	12.05	14.76	13.05	14.76	16.48	15	16.48	65.6	16.5
230	17.55	390	19						

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-186	.06	-13.91	.02	-13.9	.045	14.76	.06

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff Contr.	Expan.
-13.91	14.76			63	63	66	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-186	-13.91	16.92	F
14.76	390	16.92	F

BRIDGE

RIVER: Mill Brook

REACH: Main RS: 140

INPUT

Description: Mystic St. Bridge

Distance from Upstream XS = .5

Deck/Roadway Width = 62

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num=	16								
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-107	17.5	0	-50	17	0	-13.9	16.93	0	
-13.9	16.93	13.05	-9	16.92	13.05	-9	19.65	13.05	
-8.6	19.65	13.05	-8.6	19.65	13.05	0	19.65	13.05	
9.6	19.65	13.05	9.6	16.92	13.05	14.9	16.93	13.05	
14.9	16.93	0	94	17.1	0	230	17.9		
390	19.4								

Upstream Bridge Cross Section Data

Station Elevation Data	num=	22							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-186	20	-141	19	-80	17.18	-50	16.8	-22	16
-15.7	15	-13.91	13.05	-13.9	12.21	-12.9	12.21	-10.32	10.92
-10.32	8.6	8.43	8.6	8.43	10.6	11.01	10.6	13.76	12.05
14.76	12.05	14.76	13.05	14.76	16.48	15	16.48	65.6	16.5
230	17.55	390	19						

Manning's n Values num= 4

Sta	n	Val	Sta	n	Val	Sta	n	Val	Sta	n	Val
-186		.06	-13.91		.02	-13.9		.045	14.76		.06

Bank Sta: Left Right Coeff Contr. Expan.
 -13.91 14.76 .3 .5

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 -186 -13.91 16.92 F
 14.76 390 16.92 F

Downstream Deck/Roadway Coordinates

num= 16				Sta Hi Cord Lo Cord				Sta Hi Cord Lo Cord			
Sta	Hi	Cord	Lo Cord	-50	17	0	-13.9	16.93	0		
-107	17.5	0		-9	16.92	13.05	-9	19.65	13.05		
-13.9	16.93	13.05		-8.6	19.65	13.05	0	19.65	13.05		
-8.6	19.65	13.05		9.6	16.92	13.05	14.9	16.93	13.05		
9.6	19.65	13.05		14.9	16.93	0	230	17.9			
14.9	16.93	0		390	19.4						
				94	17.1	0					

Downstream Bridge Cross Section Data

Station	Elevation	Data	num= 24	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-214	20	-173		19	-114.5	18	-64.5	17	-35	16	
-14	14	-13.91		13.05	-13.9	12.21	-12.9	12.21	-10.32	10.92	
-10.32	8.6	8.43		8.6	8.43	10.6	11.01	10.6	13.76	12.05	
14.76	12.05	14.76		13.05	14.76	14	17.1	15	23.5	16.25	
41.5	16.7	91.5		17	204	17.16	340	19			

Manning's n Values	num= 6	Sta	n	Val	Sta	n	Val	Sta	n	Val	Sta	n	Val
-214	.06	-14	.02	-13.91	.02	-13.9	.045	14.76	.06				
41.5	.05												

Bank Sta: Left Right Coeff Contr. Expan.
 -13.91 14.76 .3 .5

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 -214 -13.9 16.92 F
 14.76 340 16.92 F

Upstream Embankment side slope	=	0 horiz. to 1.0 vertical
Downstream Embankment side slope	=	0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow	=	.98
Elevation at which weir flow begins	=	16.92
Energy head used in spillway design	=	
Spillway height used in design	=	
Weir crest shape	=	Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Pressure and Weir flow

Submerged Inlet Cd =

Submerged Inlet + Outlet Cd = .8

Max Low Cord =

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum
 Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end
 Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Mill Brook
 REACH: Main RS: 115

INPUT

Description: Downstream face of Mystic Street Bridge

Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-214	20	-173	19	-114.5	18	-64.5	17	-35	16
-14	14	-13.91	13.05	-13.9	12.21	-12.9	12.21	-10.32	10.92
-10.32	8.6	8.43	8.6	8.43	10.6	11.01	10.6	13.76	12.05
14.76	12.05	14.76	13.05	14.76	14	17.1	15	23.5	16.25
41.5	16.7	91.5	17	204	17.16	340	19		

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-214	.06	-14	.02	-13.91	.02	-13.9	.045	14.76	.06
41.5	.05								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 -13.91 14.76 45 40 30 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-214	-13.9	16.92	F
14.76	340	16.92	F

CROSS SECTION

RIVER: Mill Brook
 REACH: Main RS: 75

INPUT

Description: 40 Downstream of Mystic St. Bridge

Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-5.31	20	-5.3	11	-5.3	8.97	0	8.53	6.7	8.76
8.8	11	13	15.27	30	16	30	20		

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-5.31	.02	-5.3	.04	8.8	.07	13	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 -5.3 8.8 75 75 74 .1 .3

CROSS SECTION

RIVER: Mill Brook
 REACH: Main RS: 0

INPUT

Description: Downstream End of Model (FEMA Cross-Section E)

Station Elevation Data num= 9

Sta	Elev								
-----	------	-----	------	-----	------	-----	------	-----	------

-6.1	20	-6	10	-6	8.33	0	8.44	7	8.71
8.6	10	13.3	13.78	21.4	14	21.4	22.5		
Manning's n Values				num=	4				
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val		
-6.1	.02	-6	.04	8.6	.07	13.3	.05		
Bank Sta: Left		Right	Lengths: Left		Channel	Right	Coeff	Contr.	Expan.
-6		8.6			0	0	.1		.3

SUMMARY OF MANNING'S N VALUES

River: Mill Brook

Reach	River Sta.	n1	n2	n3	n4	n5
n6						
Main	458	.06	.04	.07		
Main	384	.06	.045	.07		
Main	309	.06	.045	.06		
Main	244	.06	.045	.02	.06	
Main	179	.06	.02	.045	.06	
Main	140	Bridge				
Main	115	.06	.02	.02	.045	.06
.05						
Main	75	.02	.04	.07	.05	
Main	0	.02	.04	.07	.05	

SUMMARY OF REACH LENGTHS

River: Mill Brook

Reach	River Sta.	Left	Channel	Right
Main	458	77	74	70
Main	384	67	74	78
Main	309	66	65	65
Main	244	66	66	66
Main	179	63	63	66
Main	140	Bridge		
Main	115	45	40	30
Main	75	75	75	74
Main	0	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

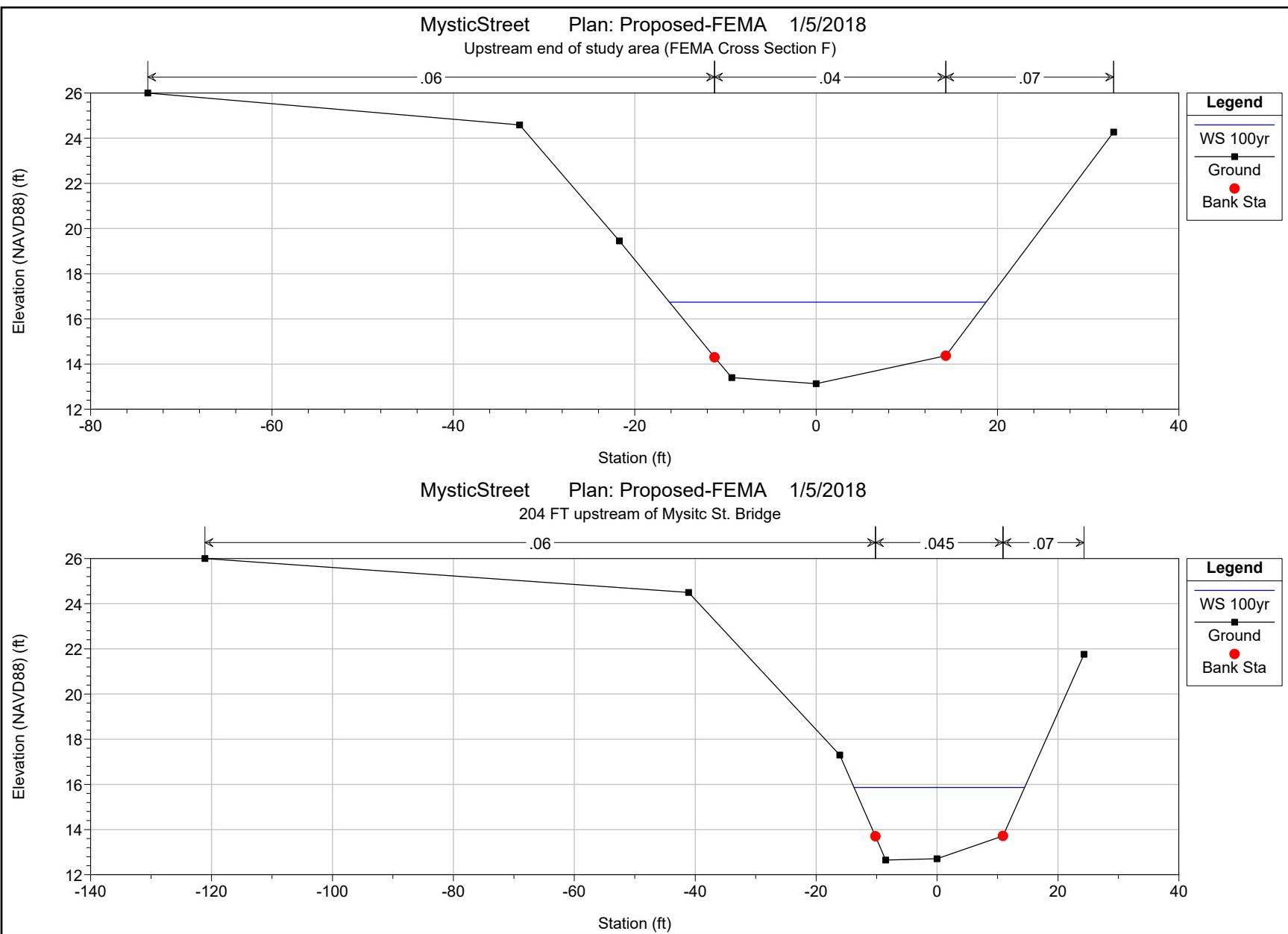
River: Mill Brook

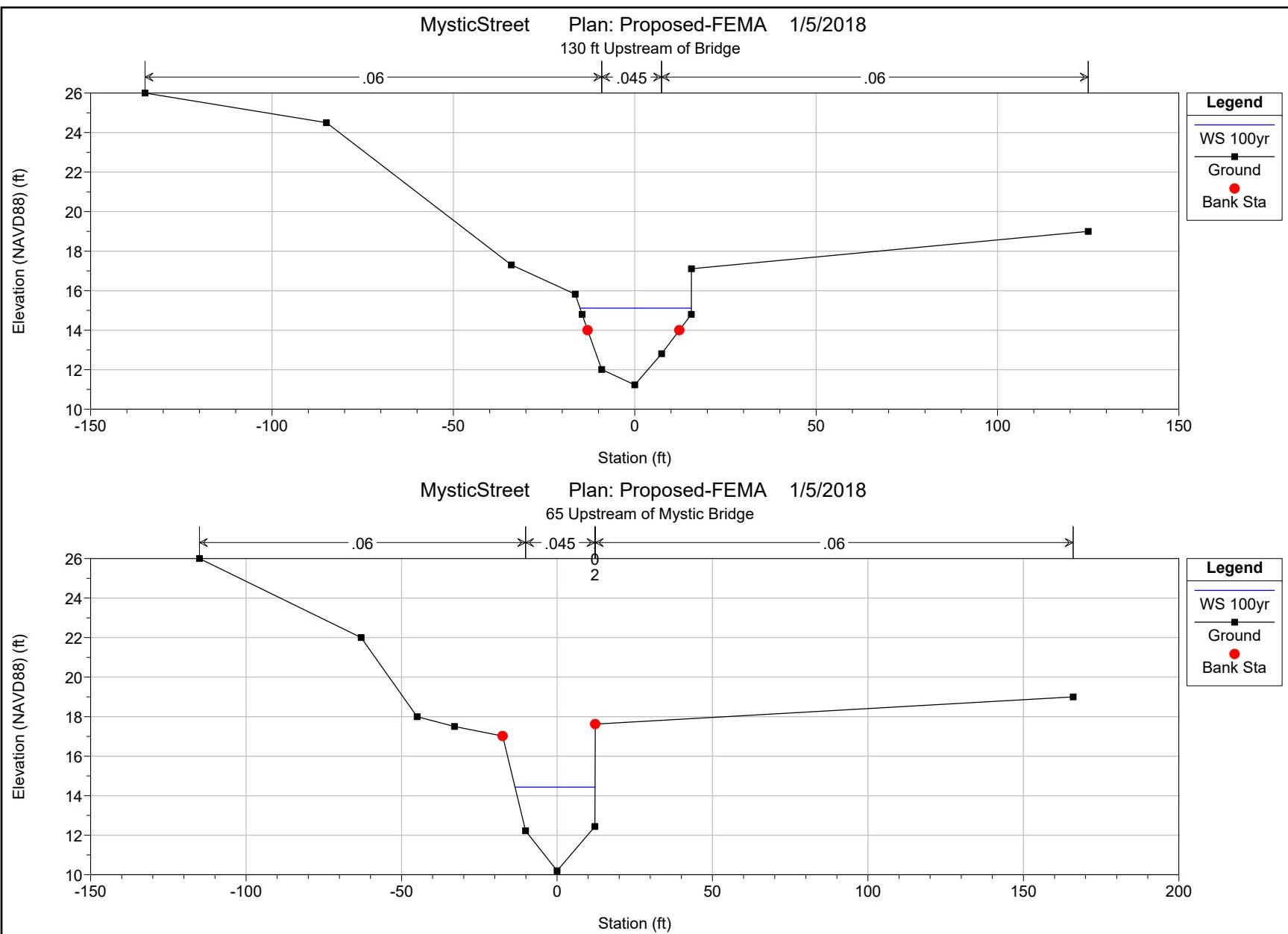
Reach	River Sta.	Contr.	Expan.
Main	458	.1	.3
Main	384	.1	.3
Main	309	.1	.3
Main	244	.1	.3
Main	179	.3	.5

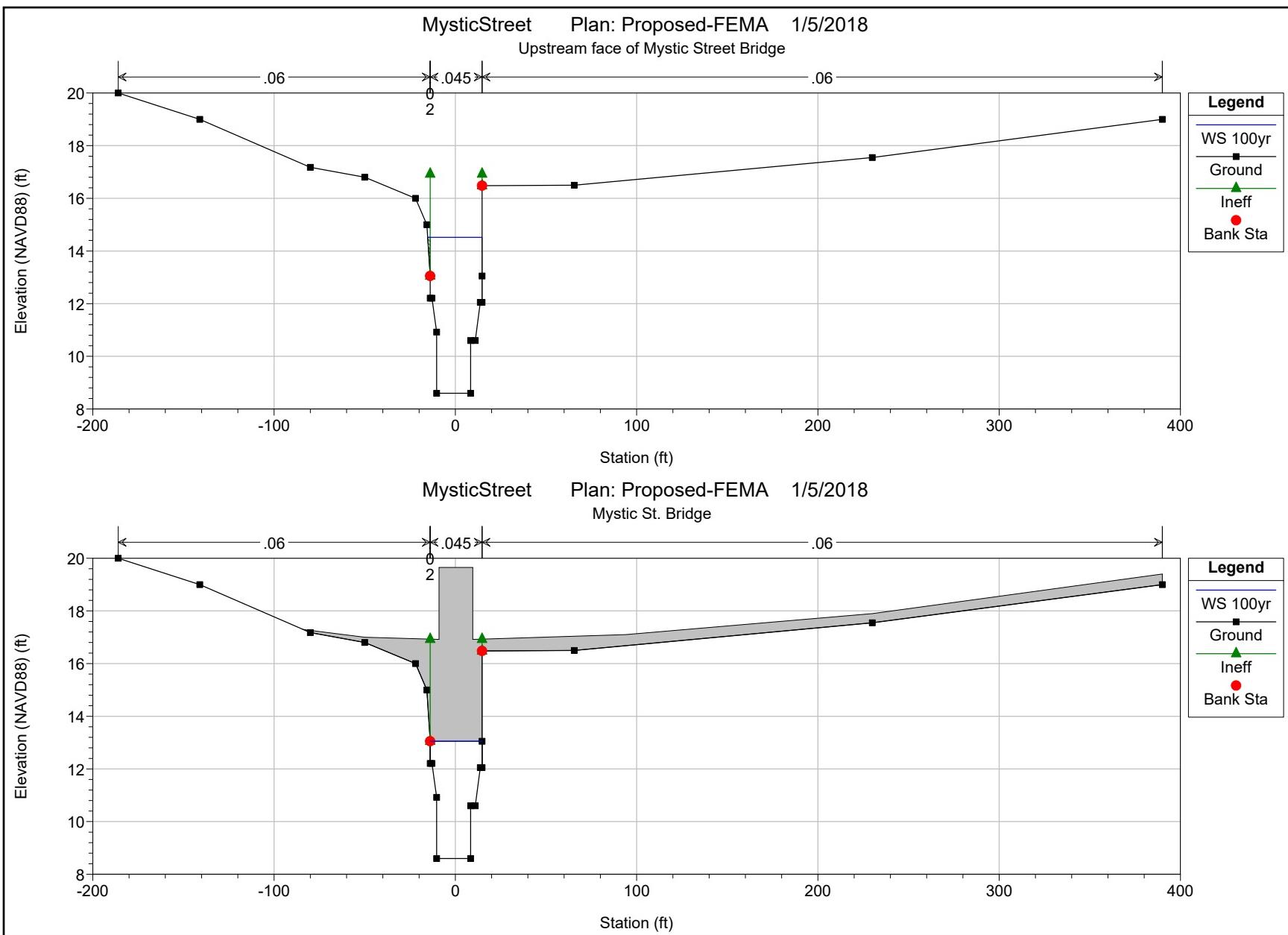
Main	140	Bridge	
Main	115	.3	.5
Main	75	.1	.3
Main	0	.1	.3

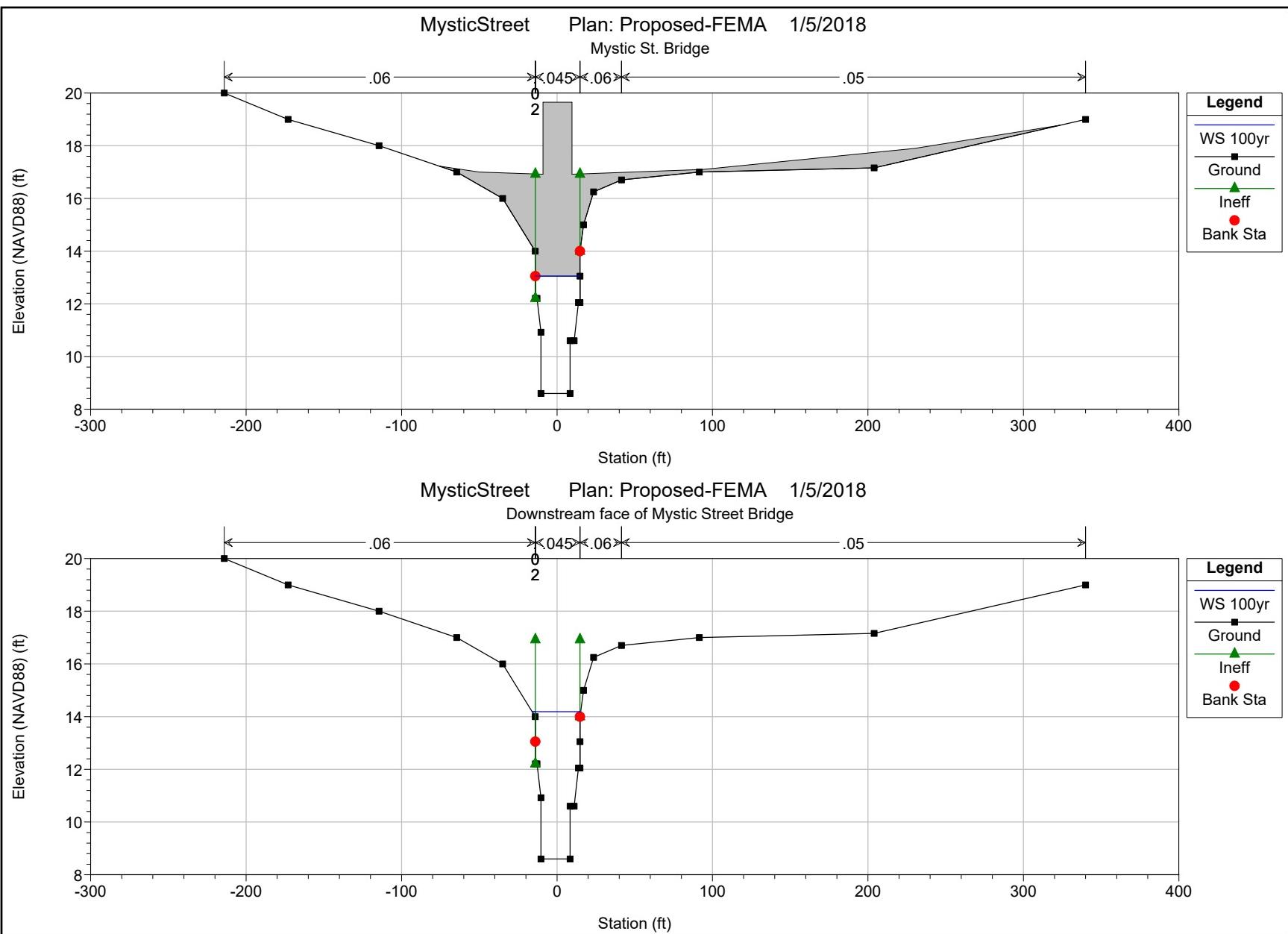
HEC-RAS Plan: Proposed-FEM River: Mill Brook Reach: Main

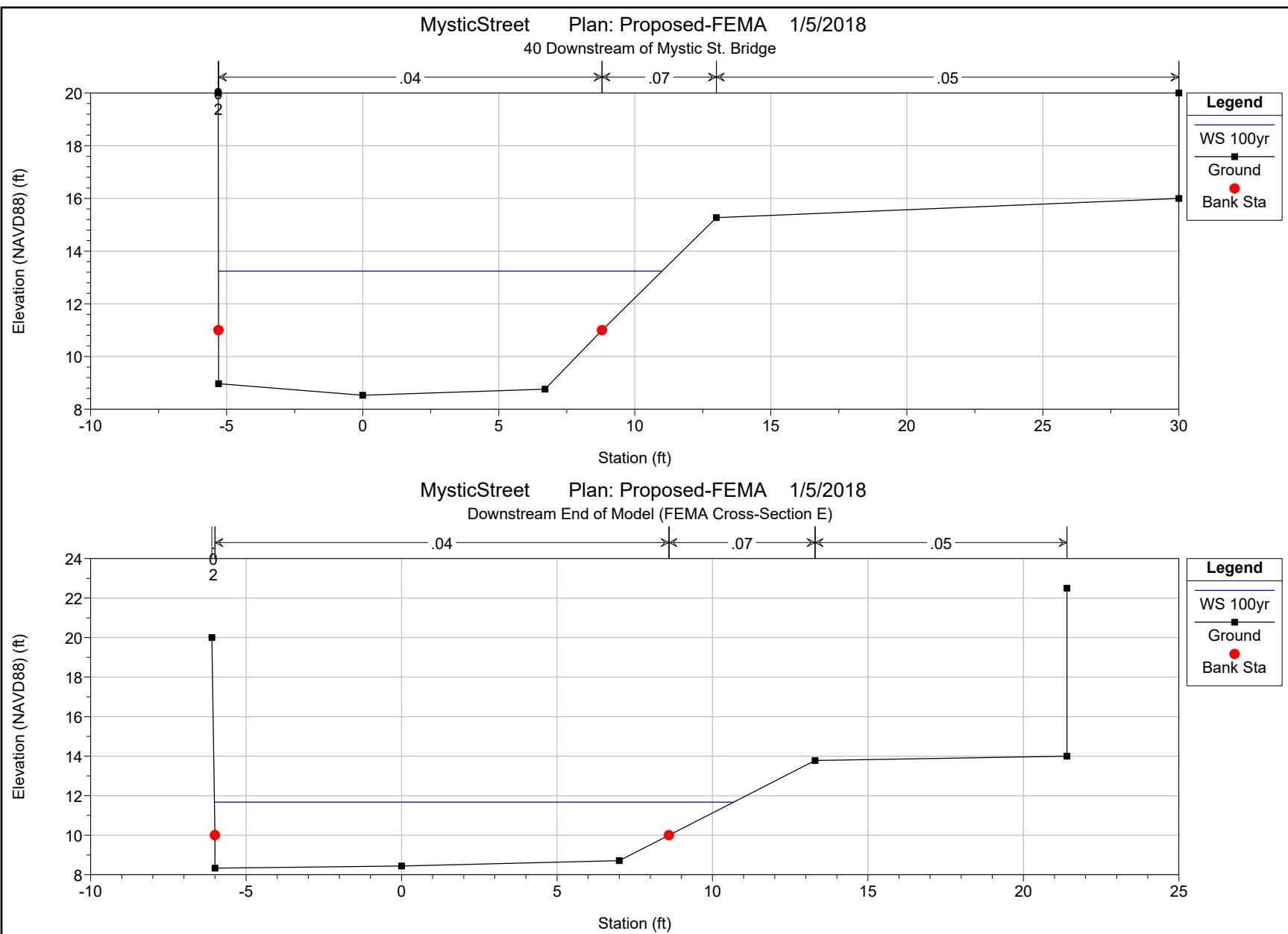
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	0	10yr	150.00	8.33	10.07	10.07	10.81	0.024644	6.93	21.66	14.68	1.00
Main	0	50yr	310.00	8.33	11.00	11.00	12.19	0.020657	8.77	35.85	15.85	1.00
Main	0	100yr	450.00	8.33	11.67	11.67	13.18	0.018842	9.88	46.90	16.70	0.99
Main	0	500yr	730.00	8.33	12.86	12.86	14.86	0.016461	11.46	67.51	18.18	0.98
Main	75	10yr	150.00	8.53	11.31	10.35	11.61	0.005396	4.35	34.52	14.41	0.49
Main	75	50yr	310.00	8.53	12.46		13.04	0.006347	6.10	51.70	15.54	0.57
Main	75	100yr	450.00	8.53	13.24	12.03	14.05	0.006868	7.23	64.16	16.31	0.61
Main	75	500yr	730.00	8.53	14.50	13.26	15.74	0.007657	9.04	85.39	17.54	0.67
Main	115	10yr	150.00	8.60	11.70	9.86	11.79	0.001938	2.39	62.75	24.98	0.27
Main	115	50yr	310.00	8.60	13.15	10.72	13.30	0.001940	3.00	103.18	28.68	0.28
Main	115	100yr	450.00	8.60	14.19	11.29	14.37	0.001822	3.39	132.75	31.16	0.28
Main	115	500yr	730.00	8.60	15.92	12.28	16.17	0.001663	4.00	182.40	55.95	0.28
Main	140	Bridge										
Main	179	10yr	150.00	8.60	11.83	9.86	11.91	0.001687	2.28	65.89	25.47	0.25
Main	179	50yr	310.00	8.60	13.25	10.72	13.39	0.001801	2.93	105.91	28.85	0.27
Main	179	100yr	450.00	8.60	14.52	11.29	14.68	0.001489	3.16	142.24	30.02	0.25
Main	179	500yr	730.00	8.60	16.98	12.28	17.14	0.000998	3.27	287.10	204.01	0.21
Main	244	10yr	150.00	10.20	12.38	12.38	12.95	0.030292	6.07	24.73	22.20	1.01
Main	244	50yr	310.00	10.20	13.10	13.10	13.97	0.026946	7.50	41.32	23.66	1.00
Main	244	100yr	450.00	10.20	14.43		15.00	0.009830	6.05	74.32	25.75	0.63
Main	244	500yr	730.00	10.20	16.92		17.33	0.003963	5.10	143.27	29.64	0.41
Main	309	10yr	150.00	11.23	13.79		14.03	0.010053	3.95	37.98	24.04	0.55
Main	309	50yr	310.00	11.23	14.64		15.06	0.010601	5.21	60.44	29.12	0.60
Main	309	100yr	450.00	11.23	15.11		15.71	0.011780	6.22	74.83	30.69	0.65
Main	309	500yr	730.00	11.23	17.16		17.62	0.004553	5.56	150.71	51.02	0.44
Main	384	10yr	150.00	12.65	14.52		14.85	0.011413	4.62	33.25	23.78	0.66
Main	384	50yr	310.00	12.65	15.34		15.90	0.011167	6.09	53.89	26.49	0.70
Main	384	100yr	450.00	12.65	15.86		16.63	0.011716	7.14	68.19	28.22	0.74
Main	384	500yr	730.00	12.65	17.35		18.13	0.007083	7.33	113.76	33.22	0.62
Main	458	10yr	150.00	13.13	15.20		15.40	0.005033	3.61	42.70	28.88	0.50
Main	458	50yr	310.00	13.13	16.11		16.44	0.004688	4.68	70.53	32.43	0.52
Main	458	100yr	450.00	13.13	16.74		17.17	0.004533	5.35	91.97	34.91	0.53
Main	458	500yr	730.00	13.13	17.99		18.52	0.003704	6.04	138.59	39.79	0.51











Proposed Conditions -Floodway

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

X	X	XXXXXX	XXXX	XXXX	XX	XXXX
X	X	X	X X	X X	X X	X
X	X	X	X	X X	X X	X
XXXXXX	XXXX	X	XXX	XXXX	XXXXXX	XXXX
X	X	X	X	X X	X X	X
X	X	X	X X	X X	X X	X
X	X	XXXXXX	XXXX	X X	X X	XXXXX

PROJECT DATA

Project Title: MysticStreet
Project File : MysticStreet.prj
Run Date and Time: 1/5/2018 2:09:12 PM

Project in English units

Project Description:

Project: Mystic Street Bridge Replacement in Arlington, MA
Done by: LEC and
RSV
Datum: NAVD88

PLAN DATA

Plan Title: Proposed - Floodway
Plan File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 01.02.18\MysticStreet.p02

Geometry Title: Proposed
Geometry File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 01.02.18\MysticStreet.g03

Flow Title : FEMA Floodway Flows
Flow File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 01.02.18\MysticStreet.f02

Plan Description:

Proposed conditions with FEMA Flows

Plan Summary Information:

Number of: Cross Sections =	8	Multiple Openings =	0
Culverts =	0	Inline Structures =	0
Bridges =	1	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3

Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary

Conveyance Calculation Method: At breaks in n values only

Friction Slope Method: Average Conveyance

Computational Flow Regime: Subcritical Flow

Encroachment Data

Equal Conveyance = True

Left Offset = 0

Right Offset = 0

River	Reach	RS	Profile	Method	Value1	Value2
Mill Brook	Main	458	100yr Floodway	1	-17	22
		384	100yr Floodway	1	-36	24
		309	100yr Floodway	1	-38	48
		244	100yr Floodway	1	-25	35
		179	100yr Floodway	1	-45	25
		115	100yr Floodway	1	-25	17
		75	100yr Floodway	1	-25	11
		0	100yr Floodway	1	-45	18

FLOW DATA

Flow Title: FEMA Floodway Flows

Flow File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 01.02.18\MysticStreet.f02

Flow Data (cfs)

River	Reach	RS	100yr	100yr Floodway
Mill Brook	Main	458	450	450

Boundary Conditions

River	Reach	Profile	Upstream
Downstream			
Mill Brook	Main	100yr	Normal S = 0.063
Known WS = 10.8			
Mill Brook	Main	100yr Floodway	Normal S = 0.063
Known WS = 10.9			

GEOMETRY DATA

Geometry Title: Proposed

Geometry File : p:\MA_PeabodyOldServer\Arlington\Mystic Bridge Survey\Hydraulics\HEC-RAS\HEC-RAS 01.02.18\MysticStreet.g03

CROSS SECTION

RIVER: Mill Brook

REACH: Main

RS: 458

INPUT

Description: Upstream end of study area (FEMA Cross Section F)

Station Elevation Data num= 8			
Sta	Elev	Sta	Elev
-73.7	26	-32.7	24.59
0	13.13	14.3	14.37
			-21.7
			19.45
			-11.2
			14.3
			-9.3
			13.4
			24.27

Manning's n Values

num= 3			
Sta	n Val	Sta	n Val
-73.7	.06	-11.2	.04
			14.3
			.07

Bank Sta: Left Right		Lengths: Left Channel Right			Coeff Contr.	Expan.
-11.2	14.3	77	74	70	.1	.3

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 384

INPUT

Description: 204 FT upstream of Mysitc St. Bridge

Station Elevation Data num= 8			
Sta	Elev	Sta	Elev
-121.1	26	-41.1	24.5
0	12.71	10.9	13.72
			-16.1
			17.3
			-10.2
			13.7
			-8.5
			12.65
			21.76

Manning's n Values

num= 3			
Sta	n Val	Sta	n Val
-121.1	.06	-10.2	.045
			10.9
			.07

Bank Sta: Left Right		Lengths: Left Channel Right			Coeff Contr.	Expan.
-10.2	10.9	67	74	78	.1	.3

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 309

INPUT

Description: 130 ft Upstream of Bridge

Station Elevation Data num= 13			
Sta	Elev	Sta	Elev
-135	26	-85	24.5
-13	14	-9.1	12.01
15.6	14.8	15.61	17.11
			-34
			17.3
			-16.4
			15.82
			-14.5
			14.8
			12.81
			12.3
			14
			19

Manning's n Values

num= 3			
Sta	n Val	Sta	n Val
-135	.06	-9.1	.045
			7.4
			.06

Bank Sta: Left Right		Lengths: Left Channel Right			Coeff Contr.	Expan.
-13	12.3	66	65	65	.1	.3

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 244

INPUT

Description: 65 Upstream of Mystic Bridge

Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-115	26	-63	22	-45	18	-33	17.5	-17.5	17.02
-10.1	12.22	0	10.2	12.2	12.44	12.3	17.62	166	19

Manning's n Values

num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-115	.06	-10.1	.045	12.2	.02	12.3	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Sta	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	-17.5	12.3		66	66	66	.1		.3

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 179

INPUT

Description: Upstream face of Mystic Street Bridge

Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-186	20	-141	19	-80	17.18	-50	16.8	-22	16
-15.7	15	-13.91	13.05	-13.9	12.21	-12.9	12.21	-10.32	10.92
-10.32	8.6	8.43	8.6	8.43	10.6	11.01	10.6	13.76	12.05
14.76	12.05	14.76	13.05	14.76	16.48	15	16.48	65.6	16.5
230	17.55	390	19						

Manning's n Values

num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-186	.06	-13.91	.02	-13.9	.045	14.76	.06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Sta	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	-13.91	14.76		63	63	66	.3		.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-186	-13.91	16.92	F
14.76	390	16.92	F

BRIDGE

RIVER: Mill Brook

REACH: Main RS: 140

INPUT

Description: Mystic St. Bridge

Distance from Upstream XS = .5

Deck/Roadway Width = 62

Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 16

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-107	17.5	0	-50	17	0	-13.9	16.93	0	0
-13.9	16.93	13.05	-9	16.92	13.05	-9	19.65	13.05	13.05
-8.6	19.65	13.05	-8.6	19.65	13.05	0	19.65	13.05	13.05
9.6	19.65	13.05	9.6	16.92	13.05	14.9	16.93	13.05	13.05
14.9	16.93	0	94	17.1	0	230	17.9		
390	19.4								

Upstream Bridge Cross Section Data

Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-186	20	-141	19	-80	17.18	-50	16.8	-22	16
-15.7	15	-13.91	13.05	-13.9	12.21	-12.9	12.21	-10.32	10.92
-10.32	8.6	8.43	8.6	8.43	10.6	11.01	10.6	13.76	12.05
14.76	12.05	14.76	13.05	14.76	16.48	15	16.48	65.6	16.5
230	17.55	390	19						

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-186	.06	-13.91	.02	-13.9	.045	14.76	.06

Bank Sta: Left Right Coeff Contr. Expan.
 -13.91 14.76 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-186	-13.91	16.92	F
14.76	390	16.92	F

Downstream Deck/Roadway Coordinates

num= 16									
Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
-107	17.5	0	-50	17	0	-13.9	16.93	0	
-13.9	16.93	13.05	-9	16.92	13.05	-9	19.65	13.05	
-8.6	19.65	13.05	-8.6	19.65	13.05	0	19.65	13.05	
9.6	19.65	13.05	9.6	16.92	13.05	14.9	16.93	13.05	
14.9	16.93	0	94	17.1	0	230	17.9		
390	19.4								

Downstream Bridge Cross Section Data

Station Elevation Data num= 24									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-214	20	-173	19	-114.5	18	-64.5	17	-35	16
-14	14	-13.91	13.05	-13.9	12.21	-12.9	12.21	-10.32	10.92
-10.32	8.6	8.43	8.6	8.43	10.6	11.01	10.6	13.76	12.05
14.76	12.05	14.76	13.05	14.76	14	17.1	15	23.5	16.25
41.5	16.7	91.5	17	204	17.16	340	19		

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-214	.06	-14	.02	-13.91	.02	-13.9	.045	14.76	.06
41.5	.05								

Bank Sta: Left Right Coeff Contr. Expan.
 -13.91 14.76 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-214	-13.9	16.92	F
14.76	340	16.92	F

Upstream Embankment side slope = 0 horiz. to 1.0 vertical

Downstream Embankment side slope = 0 horiz. to 1.0 vertical

Maximum allowable submergence for weir flow = .98

Elevation at which weir flow begins = 16.92

Energy head used in spillway design =

Spillway height used in design =

Weir crest shape = Broad Crested

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Pressure and Weir flow

Submerged Inlet Cd	=
Submerged Inlet + Outlet Cd	= .8
Max Low Cord	=

Additional Bridge Parameters

Add Friction component to Momentum

Do not add Weight component to Momentum

Class B flow critical depth computations use critical depth
inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 115

INPUT

Description: Downstream face of Mystic Street Bridge

Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-214	20	-173	19	-114.5	18	-64.5	17	-35	16
-14	14	-13.91	13.05	-13.9	12.21	-12.9	12.21	-10.32	10.92
-10.32	8.6	8.43	8.6	8.43	10.6	11.01	10.6	13.76	12.05
14.76	12.05	14.76	13.05	14.76	14	17.1	15	23.5	16.25
41.5	16.7	91.5	17	204	17.16	340	19		

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-214	.06	-14	.02	-13.91	.02	-13.9	.045	14.76	.06
41.5	.05								

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-13.91 14.76 45 40 30 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-214	-13.9	16.92	F
14.76	340	16.92	F

CROSS SECTION

RIVER: Mill Brook

REACH: Main RS: 75

INPUT

Description: 40 Downstream of Mystic St. Bridge

Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-5.31	20	-5.3	11	-5.3	8.97	0	8.53	6.7	8.76
8.8	11	13	15.27	30	16	30	20		

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-5.31	.02	-5.3	.04	8.8	.07	13	.05

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
-5.3 8.8 75 75 74 .1 .3

CROSS SECTION

RIVER: Mill Brook

REACH: Main

RS: 0

INPUT

Description: Downstream End of Model (FEMA Cross-Section E)

Station	Elevation	Data	num=	9	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-6.1	20	-6	10	-6	8.33	0	8.44	7	8.71			
8.6	10	13.3	13.78	21.4	14	21.4	22.5					

Manning's n Values

num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-6.1	.02	-6	.04	8.6	.07	13.3	.05

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	-6	8.6		0	0	0	.1		.3

SUMMARY OF MANNING'S N VALUES

River: Mill Brook

Reach	River Sta.	n1	n2	n3	n4	n5
Main	458	.06	.04	.07		
Main	384	.06	.045	.07		
Main	309	.06	.045	.06		
Main	244	.06	.045	.02	.06	
Main	179	.06	.02	.045	.06	
Main	140	Bridge				
Main	115	.06	.02	.02	.045	.06
.05						
Main	75	.02	.04	.07	.05	
Main	0	.02	.04	.07	.05	

SUMMARY OF REACH LENGTHS

River: Mill Brook

Reach	River Sta.	Left	Channel	Right
Main	458	77	74	70
Main	384	67	74	78
Main	309	66	65	65
Main	244	66	66	66
Main	179	63	63	66
Main	140	Bridge		
Main	115	45	40	30
Main	75	75	75	74
Main	0	0	0	0

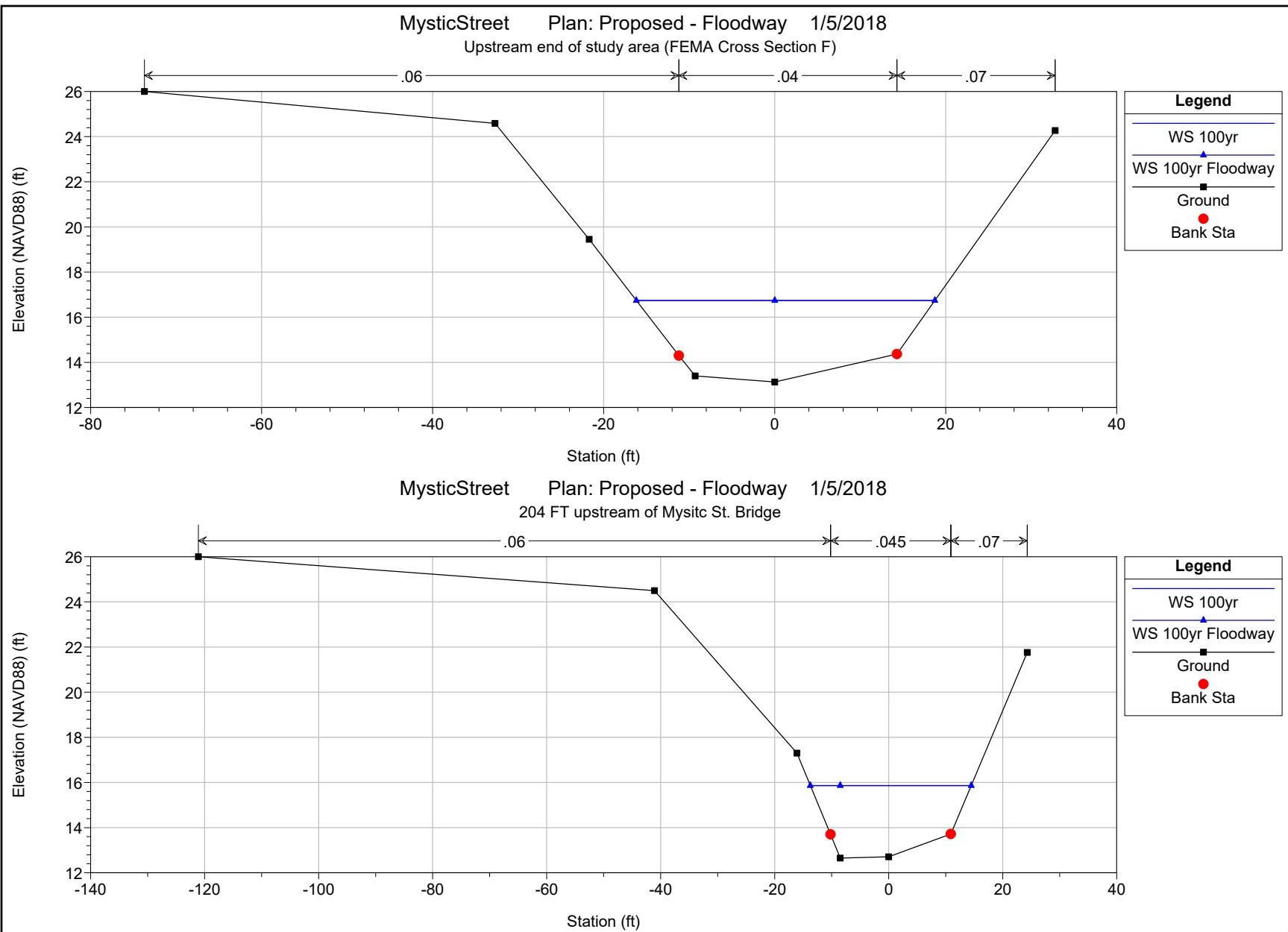
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

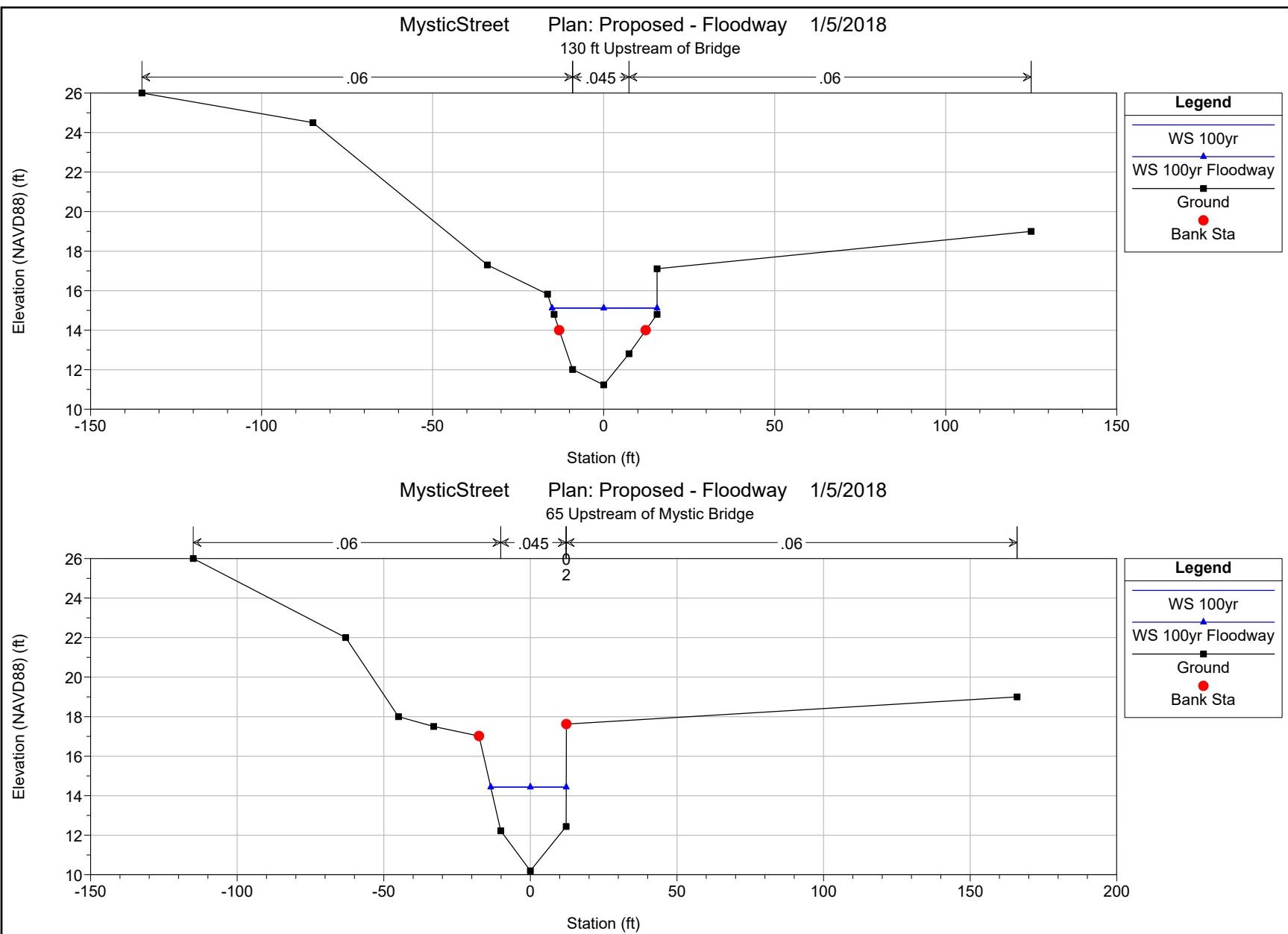
River: Mill Brook

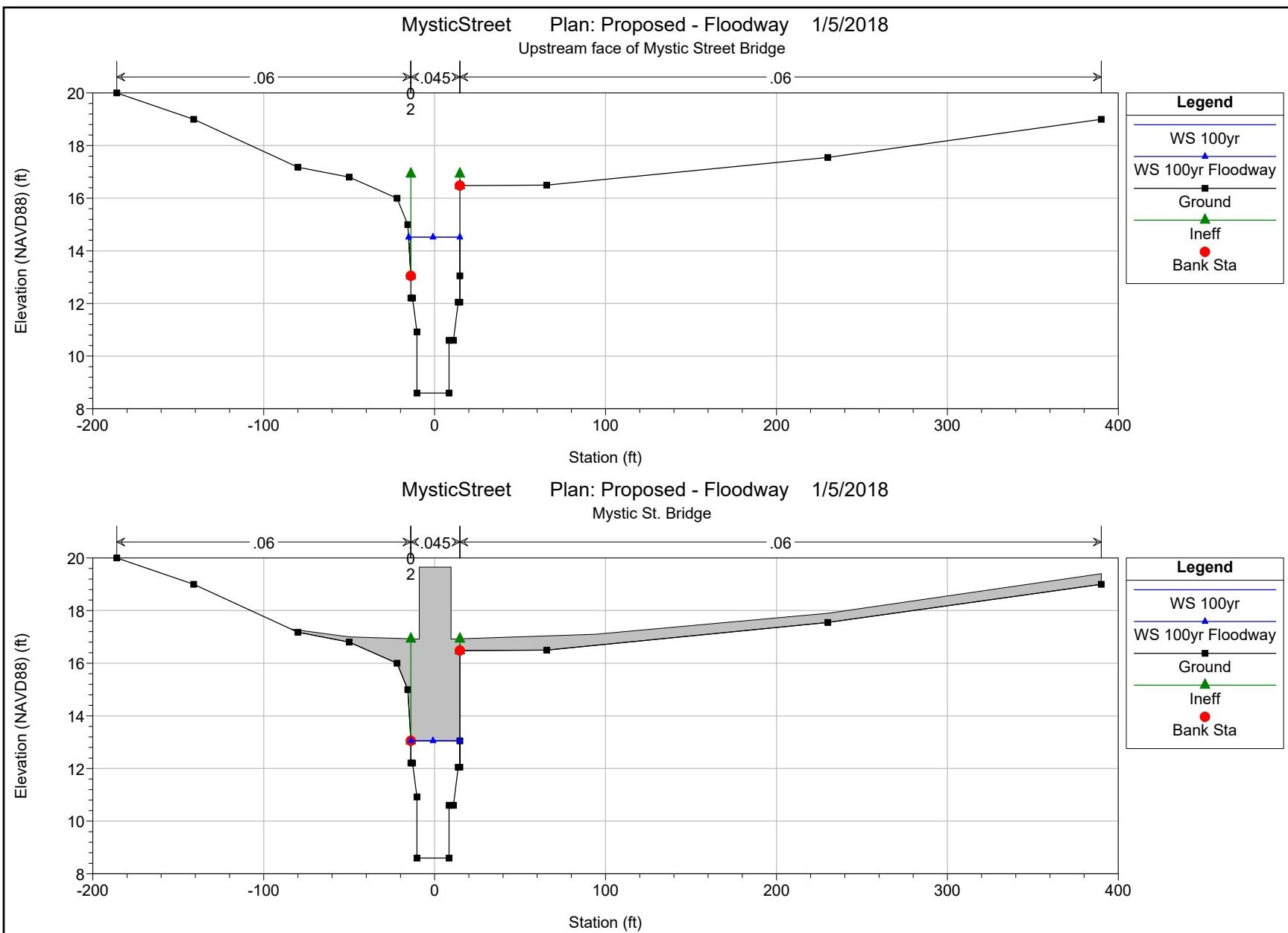
Reach	River Sta.	Contr.	Expan.
Main	458	.1	.3
Main	384	.1	.3
Main	309	.1	.3
Main	244	.1	.3
Main	179	.3	.5
Main	140	Bridge	
Main	115	.3	.5
Main	75	.1	.3
Main	0	.1	.3

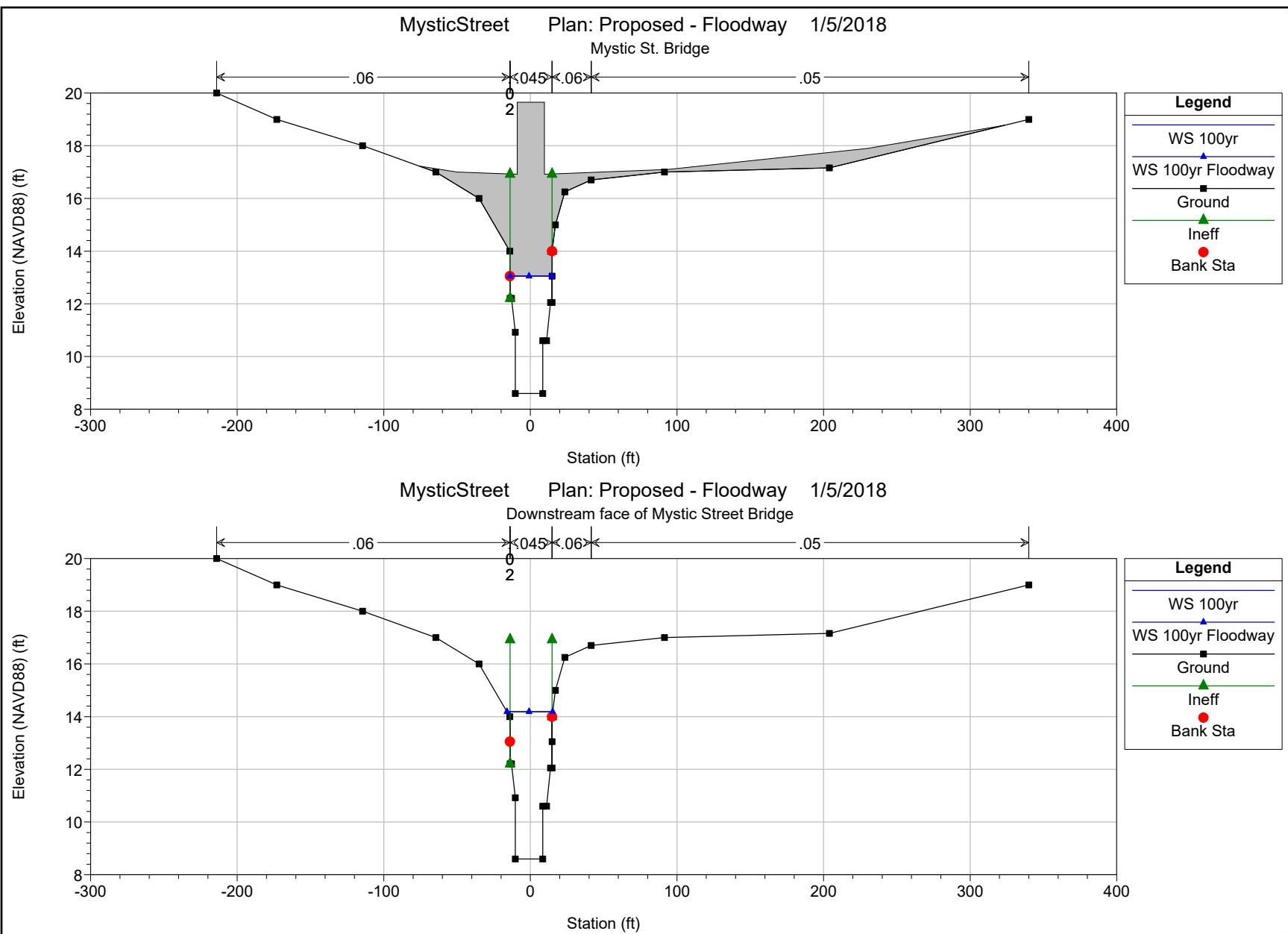
HEC-RAS Plan: Prop-Fidway River: Mill Brook Reach: Main

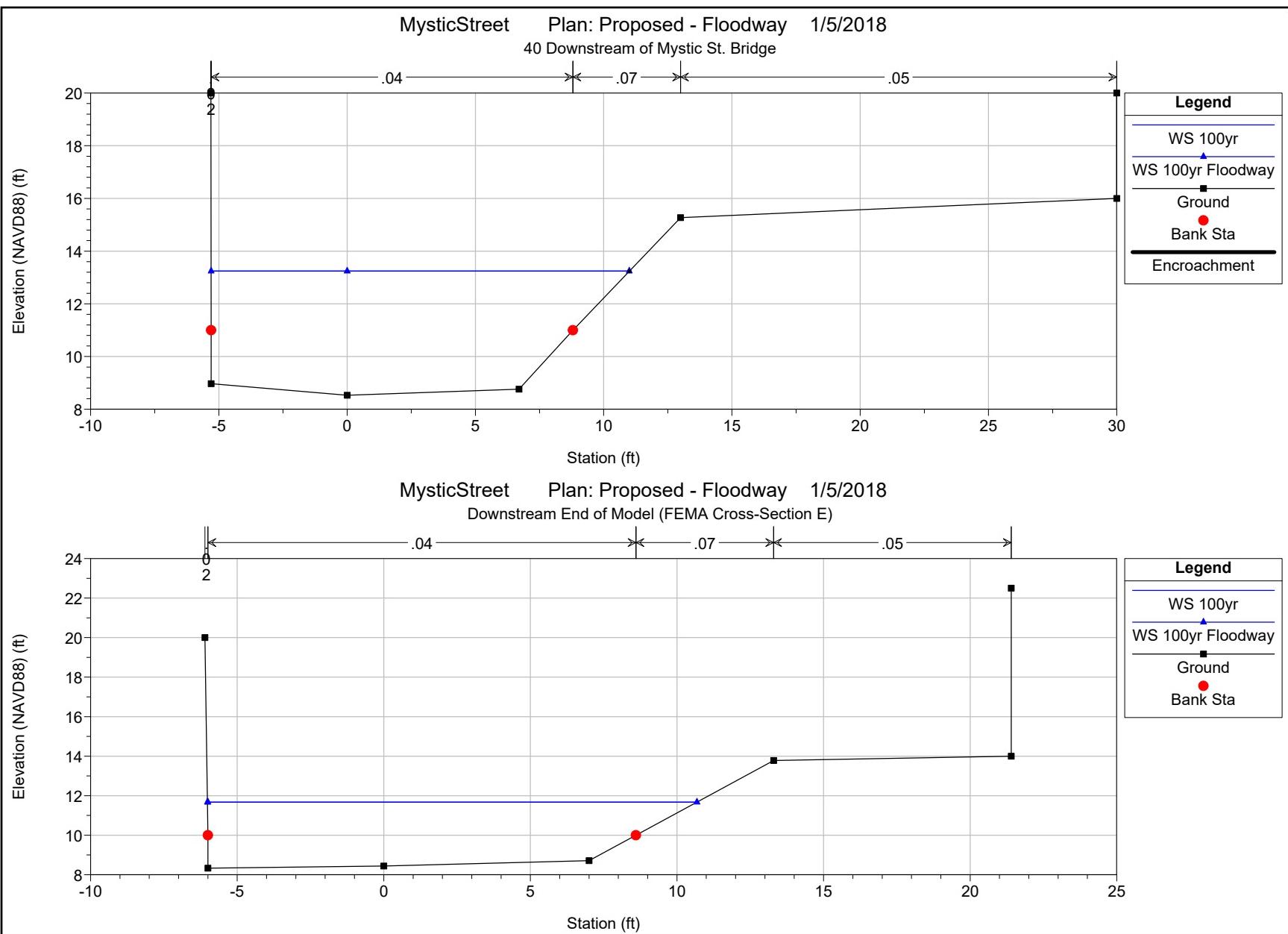
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	0	100yr	450.00	8.33	11.67	11.67	13.18	0.018836	9.88	46.91	16.70	0.99
Main	0	100yr Floodway	450.00	8.33	11.67	11.67	13.18	0.018836	9.88	46.91	16.70	0.99
Main	75	100yr	450.00	8.53	13.24	12.03	14.05	0.006866	7.23	64.17	16.31	0.61
Main	75	100yr Floodway	450.00	8.53	13.24	12.03	14.05	0.006869	7.24	64.16	16.30	0.61
Main	115	100yr	450.00	8.60	14.19	11.29	14.37	0.001822	3.39	132.75	31.16	0.28
Main	115	100yr Floodway	450.00	8.60	14.19	11.29	14.36	0.001822	3.39	132.75	31.15	0.28
Main	140	Bridge										
Main	179	100yr	450.00	8.60	14.52	11.29	14.68	0.001489	3.16	142.24	30.02	0.25
Main	179	100yr Floodway	450.00	8.60	14.52	11.29	14.68	0.001489	3.16	142.24	30.02	0.25
Main	244	100yr	450.00	10.20	14.43		15.00	0.009828	6.05	74.33	25.75	0.63
Main	244	100yr Floodway	450.00	10.20	14.43		15.00	0.009831	6.05	74.32	25.75	0.63
Main	309	100yr	450.00	11.23	15.11		15.71	0.011779	6.22	74.83	30.69	0.65
Main	309	100yr Floodway	450.00	11.23	15.11		15.71	0.011781	6.22	74.83	30.69	0.65
Main	384	100yr	450.00	12.65	15.86		16.63	0.011716	7.14	68.19	28.22	0.74
Main	384	100yr Floodway	450.00	12.65	15.86		16.63	0.011716	7.14	68.19	28.22	0.74
Main	458	100yr	450.00	13.13	16.74		17.17	0.004533	5.35	91.97	34.91	0.53
Main	458	100yr Floodway	450.00	13.13	16.74		17.17	0.004533	5.35	91.97	34.91	0.53









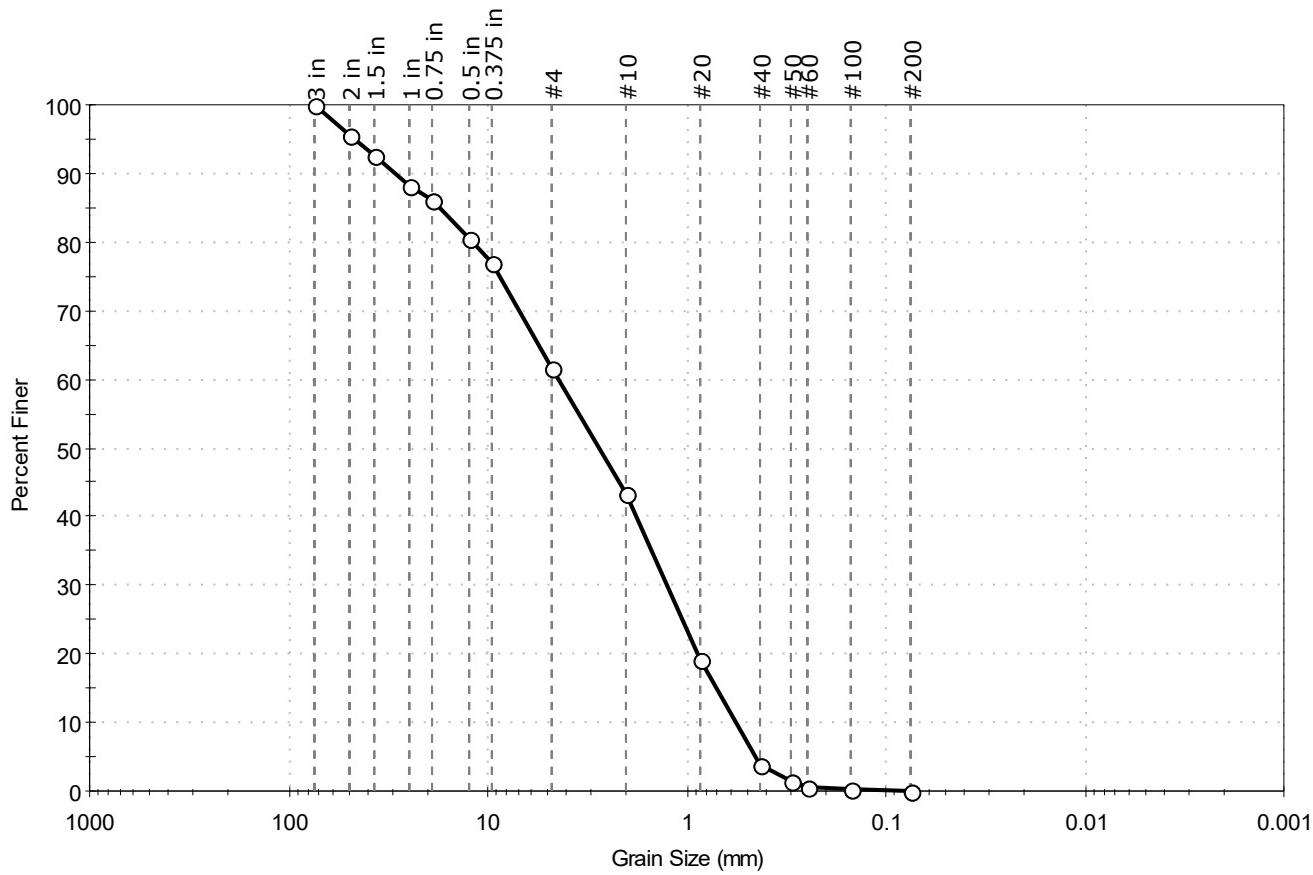


APPENDIX F

Scour Computations

Client:	Weston & Sampson Engineers	Project No:	GTX-306702
Project:	Mystic St. Bridge	Tested By:	jbr
Location:	Arlington, MA	Test Date:	07/13/17
Boring ID:	---	Sample Type:	bucket
Sample ID:	Stream Bed	Checked By:	emm
Depth :	---	Test Id:	417101
Test Comment:	---		
Visual Description:	Moist, brown sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	38.4	61.5	0.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 in	75.00	100		
2 in	50.00	96		
1.5 in	37.50	93		
1 in	25.00	88		
0.75 in	19.00	86		
0.5 in	12.50	80		
0.375 in	9.50	77		
#4	4.75	62		
#10	2.00	43		
#20	0.85	19		
#40	0.42	4		
#50	0.30	2		
#60	0.25	1		
#100	0.15	0		
#200	0.075	0.1		

Coefficients	
$D_{85} = 17.3671$ mm	$D_{30} = 1.2452$ mm
$D_{60} = 4.3966$ mm	$D_{15} = 0.7031$ mm
$D_{50} = 2.7410$ mm	$D_{10} = 0.5626$ mm
$C_u = 7.815$	$C_c = 0.627$

Classification	
ASTM	Poorly graded sand with gravel (SP)
AASHTO	Stone Fragments, Gravel and Sand (A-1-a (1))

Sample/Test Description	
Sand/Gravel Particle Shape :	ANGULAR
Sand/Gravel Hardness :	HARD

Abutment Scour Summary- Proposed Mystic Street Bridge

Mystic Street over Mill Brook, Arlington

January 2, 2017

Scour Estimates based on FHWA's HEC-18 (2012)

Abutment #1

Northerly Abutment

Left Abutment looking Downstream

Discharge Frequency (years)	HEC-18 Scour Depth (feet)					NCHRP 24-20 Total Scour Depth (feet)	Recommended Total Scour Method	Recommended Total Scour Depth (feet)
	Long-Term	Contraction	Pressure Flow (Vertical)	Amended Abutment	Total			
10	0.0	0.00	N/A	0.00	0.00	0.00	NCHRP 24-20	0.00
50	0.0	N/A	0.00	0.45	0.45	N/A	HEC-18	0.45
100	0.0	N/A	0.00	0.85	0.85	N/A	HEC-18	0.85
200	0.0	N/A	0.36	1.24	1.60	N/A	HEC-18	1.60

Assumed Ground Elevation at Base of Abutment = 8.60 feet (NAVD88) minimum thalweg elevation at downstream side

Foundation: Piles

Abutment, Top of Footing Elevation = 11.21 feet (NAVD88) (Assumed Foundation)

Abutment, Bottom of Footing Elevation = 11.21 feet (NAVD88) (Assumed Foundation)

Assumed Top of Bedrock Elevation = -18.79 feet (NAVD88) Competent rock not found

Discharge Frequency (years)	Long-Term + Contraction Scour*		Total Scour			
	Elevation (feet)	Foundation Design	Computed Scour Elevation (feet)	Computed Elevation Relative to Bedrock (feet)	Actual Scour Elevation (feet)	Foundation Design
10	8.60	Below Top of Footing, NG	8.60	+27.39 ← Total Scour above Top of Rock	8.60	Design for Unbraced Length
50	8.60	Below Top of Footing, NG	8.15	+26.94 ← Total Scour above Top of Rock	8.15	Design for Unbraced Length
100	8.60	Below Top of Footing, NG	7.75	+26.54 ← Total Scour above Top of Rock	7.75	Design for Unbraced Length
200	8.60	Below Top of Footing, NG	7.00	+25.79 ← Total Scour above Top of Rock	7.00	Design for Unbraced Length

*Assumed to be horizontal contraction scour if pressure flow conditions

Abutment Scour Summary- Proposed Mystic Street Bridge

Mystic Street over Mill Brook, Arlington

January 2, 2017

Scour Estimates based on FHWA's HEC-18 (2012)

Abutment #2

Southerly Abutment

Right Abutment looking Downstream

Discharge Frequency (years)	HEC-18 Scour Depth (feet)					NCHRP 24-20 Total Scour Depth (feet)	Recommended Total Scour Method	Recommended Total Scour Depth (feet)
	Long-Term	Contraction	Pressure Flow (Vertical)	Amended Abutment	Total			
10	0.0	0.00	N/A	0.00	0.00	0.00	HEC-18	0.00
50	0.0	N/A	0.00	0.83	0.83	N/A	HEC-18	0.83
100	0.0	N/A	0.00	1.56	1.56	N/A	HEC-18	1.56
200	0.0	N/A	0.36	2.04	2.40	N/A	HEC-18	2.40

Assumed Ground Elevation at Base of Abutment = 8.60 feet (NAVD88) minimum thalweg elevation at downstream side

Foundation: Piles

Abutment, Top of Footing Elevation = 11.05 feet (NAVD88) (Assumed Foundation)

Abutment, Bottom of Footing Elevation = 11.05 feet (NAVD88) (Assumed Foundation)

Assumed Top of Bedrock Elevation = -18.95 feet (NAVD88) Competent rock not found

Discharge Frequency (years)	Long-Term + Contraction Scour*		Total Scour			
	Elevation (feet)	Foundation Design	Computed Scour Elevation (feet)	Computed Elevation Relative to Bedrock (feet)	Actual Scour Elevation (feet)	Foundation Design
10	8.60	Below Top of Footing, NG	8.60	+27.55 ← Total Scour above Top of Rock	8.60	Design for Unbraced Length
50	8.60	Below Top of Footing, NG	7.77	+26.72 ← Total Scour above Top of Rock	7.77	Design for Unbraced Length
100	8.60	Below Top of Footing, NG	7.04	+25.99 ← Total Scour above Top of Rock	7.04	Design for Unbraced Length
200	8.60	Below Top of Footing, NG	6.20	+25.15 ← Total Scour above Top of Rock	6.20	Design for Unbraced Length

*Assumed to be horizontal contraction scour if pressure flow conditions

Contraction Scour- Proposed Mystic Street Bridge
Mystic Street over Mill Brook, Arlington
January 2, 2017
Scour Estimates based on FHWA's HEC-18 (2012)

Note- Section, equation, table and figure references are to HEC-18 (2012)

Structure Type: Bridge



If No Pressure Flow, Compute Contraction Scour using Live-Bed (Eq. 6.2) and Clear Water (Eq. 6.4) Equations

Pressure Flow:

Discharge Frequency (years)	Pressure Flow?	Contraction/Pressure Flow Vertical Scour:
10	No	Compute Contraction Scour, Sections 6.3 and 6.4
50	Yes	Compute Pressure Flow Vertical Scour, Section 6.10
100	Yes	Compute Pressure Flow Vertical Scour, Section 6.10
200	Yes	Compute Pressure Flow Vertical Scour, Section 6.10

Determination of Critical Velocity:

If $V_1 < V_c$, then clear-water contraction scour occurs.

If $V_1 > V_c$, then live-bed contraction scour occurs.

Variable	Discharge Frequency (years)				Notes
	10	50	100	200	
y_1	Channel Average Depth at Approach Section, feet	1.58	2.34	2.82	3.41
D_{50}	Size of Bed Material, mm	2.74	2.74	2.74	2.74
V_c	Critical Velocity, fps	2.51	2.68	2.76	2.85
V_1	Channel Velocity in the Approach Section, fps	3.94	5.21	6.22	6.09

Live Bed or Clear Water Contraction Scour? Live-Bed Live-Bed Live-Bed Live-Bed

Live-Bed Contraction Scour (HEC-18, Section 6.3- Modified 1960 Laursen's Equation):

Variable	Discharge Frequency (years)				Notes
	10	50	100	200	
y_1	Channel Average Depth at Approach Section, feet	1.58	2.34	2.82	3.41
y_0	Channel Average Depth Inside the Bridge Opening, feet	3.22	4.45	4.45	4.45
Q_1	Channel Flow at the Approach Section, cfs	150.00	310.00	450.00	540.00
Q_2	Channel Flow through the Bridge Opening, cfs	150.00	310.00	450.00	540.00
W_1	Channel Top Width at the Approach Section, feet	24.04	25.30	25.30	25.30
W_2	Channel Top Width Inside the Bridge Opening, feet	28.66	28.66	28.66	28.66
S_1	Energy Gradieline Slope at Approach Section, ft/ft	0.010053	0.010601	0.011178	0.008766
ω	Fall Velocity, m/s	0.240	0.240	0.240	0.240
V_s	Shear Velocity in Upstream Section, fps [$(gy_1S_1)^{1/2}$]	0.72	0.89	1.01	0.98
V_s/ω	Ratio of Shear Velocity to Fall Velocity	0.91	1.14	1.28	1.25
k_1	Mode of Bed Material Transport Exponent	0.64	0.64	0.64	0.64
y_2	Average Depth in the Contracted Section, feet	1.41	2.16	2.60	3.15

y_s Live-Bed Contraction Scour Depth, feet =

0.00	Pressure Flow	Pressure Flow	Pressure Flow	(Equation 6.3), N/A if pressure flow
0.00	0.00	0.00	0.00	

Clear-Water Contraction Scour (HEC-18, Section 6.4- Laursen 1963):

Variable	Discharge Frequency (years)				Notes
	10	50	100	200	
y_0	Channel Average Depth Inside the Bridge Opening, feet	3.22	4.45	4.45	4.45
Q_2	Channel Flow through the Bridge Opening, cfs	150.00	310.00	450.00	540.00
W_2	Channel Top Width Inside the Bridge Opening, feet	28.66	28.66	28.66	28.66
D_m	Diameter of Smallest Nontransportable Particle, feet	0.0112	0.0112	0.0112	0.0112
y_2	Average Depth in the Contracted Section, feet	1.85	3.45	4.75	5.55

y_s Clear-Water Contraction Scour Depth, feet =

N/A	Pressure Flow	Pressure Flow	Pressure Flow	(Equation 6.5), N/A if pressure flow
N/A	N/A	N/A	N/A	

Pressure Flow Vertical Contraction Scour- Proposed Mystic Street Bridge
Mystic Street over Mill Brook, Arlington
January 2, 2017
Scour Estimates based on FHWA's HEC-18 (2012)

Note- Section, equation and table references are to HEC-18 (2012)

Pressure Flow:

Discharge Frequency (years)	Pressure Flow?	Pressure Flow Vertical Contraction Scour:
10	No	No Pressure Flow Vertical Contraction Scour
50	Yes	Estimate Pressure Flow Vertical Contraction Scour
100	Yes	Estimate Pressure Flow Vertical Contraction Scour
200	Yes	Estimate Pressure Flow Vertical Contraction Scour

Contraction Scour:

Discharge Frequency (years)	Clear-Water or Live-Bed?	Contraction Scour Equation:
10	Live-Bed	N/A
50	Live-Bed	Use Equation 6.2
100	Live-Bed	Use Equation 6.2
200	Live-Bed	Use Equation 6.2

Bridge Deck Overtopping Flows:

Discharge Frequency (years)	Bridge Deck Overtopping?	Disregard Deck Overtopping Flows:
10	No	N/A
50	No	N/A
100	No	N/A
200	No	N/A

For Bridge Overtopping Conditions:

Variable		Discharge Frequency (years)				Notes
		10	50	100	200	
Q_s	Channel Flow through the Bridge Opening, cfs	150.00	310.00	450.00	540.00	Flow through Bridge, excluding Weir Flow
Q_l	Channel Flow at the Approach Section, cfs	150.00	310.00	450.00	540.00	From HEC-RAS, Section 309
h_b	Vertical Size of Bridge Opening Prior to Scour, feet	3.22	4.45	4.45	4.45	$= y_0$, Channel Ave. Depth Inside Bridge Opening
T	Height of Superstructure Obstruction, feet	4.03	4.20	4.03	4.20	Includes girders, deck and parapet
	Computed Flood Elevation, feet	13.79	14.64	15.11	15.70	From HEC-RAS, Section 309
	Low Chord Elevation, feet	13.05	13.05	13.05	13.05	Maximum elevation, at northerly abutment
h_{ue}	Effective Upstream Channel Flow Depth, feet	3.96	6.04	6.51	7.10	For Deck Overtopping, $h_{ue} = h_b + T$
h_u	Upstream Channel Flow Depth, feet	3.96	6.04	6.51	7.10	
Q_{ue}	Effective Channel Discharge, cfs	150.00	310.00	450.00	540.00	Equation 6.15 for Deck Overtopping

Separation Zone Thickness

Variable		Discharge Frequency (years)				Notes
		10	50	100	200	
h_b	Vertical Size of Bridge Opening Prior to Scour, feet	3.22	4.45	4.45	4.45	$= y_0$, Channel Ave. Depth Inside Bridge Opening
h_u	Upstream Channel Flow Depth, feet	3.96	6.04	6.51	7.10	
h_t	Distance from Water Surface to Low Chord, feet	0.74	1.59	2.06	2.65	$= h_u - h_b$
T	Height of Superstructure Obstruction, feet	4.03	4.20	4.03	4.20	Includes girders, deck and parapet
h_w	Weir Flow Height, feet	0.00	0.00	0.00	0.00	$= h_t - T$ for $h_t > T$ $= 0$ for $h_t \leq T$
t	Separation Zone Thickness, feet		1.60	1.64	1.66	Equation 6.16

For Live-Bed Contraction Scour Conditions (HEC-18, Section 6.3- Modified 1960 Laursen's Equation):

Variable		Discharge Frequency (years)				Notes
		10	50	100	200	
y_1	Channel Average Depth at Approach Section, feet	1.58	2.34	2.82	3.41	Modify for Deck Overtopping Conditions
y_o	Channel Average Depth Inside the Bridge Opening, feet	3.22	4.45	4.45	4.45	From HEC-RAS, Section 140 BR U
Q_l	Channel Flow at the Approach Section, cfs	150.00	310.00	450.00	540.00	Modify for Deck Overtopping Conditions
Q_s	Channel Flow through the Bridge Opening, cfs	150.00	310.00	450.00	540.00	Flow through Bridge, excluding Weir Flow
W_1	Channel Top Width at the Approach Section, feet	24.04	25.30	25.30	25.30	From HEC-RAS, Section 309
W_2	Channel Top Width Inside the Bridge Opening, feet	28.66	28.66	28.66	28.66	Clear span length
k_l	Mode of Bed Material Transport Exponent	0.64	0.64	0.64	0.64	See table on page 6.10
y_2	Average Depth in the Contracted Section, feet	1.41	2.16	2.60	3.15	Equation 6.2
y_s	Live-Bed Pressure Flow Vertical Scour, feet =	N/A	0.00	0.00	0.36	(Equation 6.14)

For Clear-Water Contraction Scour Conditions (HEC-18, Section 6.4- Laursen 1963):

Variable		Discharge Frequency (years)				Notes
		10	50	100	200	
y_o	Channel Average Depth Inside the Bridge Opening, feet	3.22	4.45	4.45	4.45	From HEC-RAS, Section 140 BR U
Q_s	Channel Flow through the Bridge Opening, cfs	150.00	310.00	450.00	540.00	Flow through Bridge, excluding Weir Flow
W_2	Channel Top Width Inside the Bridge Opening, feet	28.66	28.66	28.66	28.66	Clear span length
D_m	Diameter of Smallest Nontransportable Particle, feet	0.0112	0.0112	0.0112	0.0112	$1.25D_{50}$
y_2	Average Depth in the Contracted Section, feet	1.85	3.45	4.75	5.55	Equation 6.4
y_s	Clear-Water Pressure Flow Vertical Scour, feet =	N/A	N/A	N/A	N/A	(Equation 6.14)

Amended Froehlich's Abutment Scour- Proposed Mystic Street Bridge
Mystic Street over Mill Brook, Arlington
January 2, 2017
Scour Estimates based on FHWA's HEC-18 (2012)

Note- Table references are to HEC-18 (2012)

Abutment #1

Northerly Abutment

Left Abutment looking Downstream

Variable	Abutment Shape	Discharge Frequency (years)				Notes
		10	50	100	200	
	Vertical-Wall w/ Wing Walls					
K ₁	Coefficient for Abutment Shape (Table 8.1)	0.82	0.82	0.82	0.82	
Θ	Abutment Skew ($\Theta < 90$ if Embankment Points Downstream, $\Theta > 90$ if Embankment Points Upstream)	15	15	15	15	
K ₂	Coefficient for Angle of Embankment to Flow	0.79	0.79	0.79	0.79	$(\Theta / 90)^{0.13}$
L'	Length of Abutment Projected Normal to Flow, feet	0.00	1.19	2.09	3.18	From HEC-RAS, Section 309
Q _e	Flow Obstructed by Embankment at Approach Section, cfs	0.00	0.42	1.95	5.21	From HEC-RAS, Section 309
A _e	Flow Area Obstructed by Embankment at Approach Section, ft ²	0.00	0.38	1.16	2.72	From HEC-RAS, Section 309
V _e	Vel. of Flow Obstructed by Embankment at Approach Section, cfs	N/A	1.11	1.68	1.92	Q _e / A _e
Fr	Froude Number at Approach Section	0.00	0.34	0.40	0.37	V _e / (gy _a) ^{0.5}
y _a	Average Depth of Flow on Floodplain at Approach Section, feet	0.00	0.32	0.56	0.85	From HEC-RAS, Section 309

y_s

Amended Abutment Scour Depth, feet =

0.00 0.45 0.85 1.24 (ConnDOT 2000 *Drainage Manual*, page 9.B-2)

Table 8.1. Abutment Shape Coefficients.	
Description	K ₁
Vertical-wall abutment	1.00
Vertical-wall abutment with wing walls	0.82
Spill-through abutment	0.55

Amended Froehlich's Abutment Scour- Proposed Mystic Street Bridge
Mystic Street over Mill Brook, Arlington
January 2, 2017
Scour Estimates based on FHWA's HEC-18 (2012)

Note- Table references are to HEC-18 (2012)

Abutment #2

Southerly Abutment

Right Abutment looking Downstream

Variable		Discharge Frequency (years)				Notes
		10	50	100	200	
	Abutment Shape	Vertical-Wall w/ Wing Walls	Vertical-Wall w/ Wing Walls	Vertical-Wall w/ Wing Walls	Vertical-Wall w/ Wing Walls	
K ₁	Coefficient for Abutment Shape (Table 8.1)	0.82	0.82	0.82	0.82	
Θ	Abutment Skew ($\Theta < 90$ if Embankment Points Downstream, $\Theta > 90$ if Embankment Points Upstream)	105	105	105	105	
K ₂	Coefficient for Angle of Embankment to Flow	1.02	1.02	1.02	1.02	$(\Theta / 90)^{0.13}$
L'	Length of Abutment Projected Normal to Flow, feet	0.00	2.63	3.30	3.30	From HEC-RAS, Section 309
Q _e	Flow Obstructed by Embankment at Approach Section, cfs	0.00	0.98	4.69	9.99	From HEC-RAS, Section 309
A _e	Flow Area Obstructed by Embankment at Approach Section, ft ²	0.00	0.84	2.36	4.30	From HEC-RAS, Section 309
V _e	Vel. of Flow Obstructed by Embankment at Approach Section, cfs	N/A	1.17	1.99	2.32	Q _e / A _e
Fr	Froude Number at Approach Section	0.00	0.36	0.42	0.36	$V_e / (gy_a)^{0.5}$
y _a	Average Depth of Flow on Floodplain at Approach Section, feet	0.00	0.32	0.71	1.30	From HEC-RAS, Section 309
y _s	Amended Abutment Scour Depth, feet =	0.00	0.83	1.56	2.04	(ConnDOT 2000 <i>Drainage Manual</i> , page 9.B-2)

NCHRP 24-20 Abutment Scour- Proposed Mystic Street Bridge
Mystic Street over Mill Brook, Arlington

January 2, 2017

Scour Estimates based on FHWA's HEC-18 (2012) and National Cooperative Highway Research Program's 24-20 Report (2010)

Notes- References are to HEC-18 (2012), Section 8.6.3
Method not applicable to pressure flow conditions.

Abutment #1

Northerly Abutment

Left Abutment looking Downstream

Variable		Discharge Frequency (years)				Notes
		10	50	100	200	
	Set-Back Length, feet	0.00	0.00	0.00	0.00	Assume negligible
	Average Channel Flow Depth, feet	3.22	4.45	4.45	4.45	From HEC-RAS, Section 140 BR U
SBR	Set-Back Ratio: (Set-Back Length)/(Ave. Channel Flow Depth)	0.0	0.0	0.0	0.0	If SBR<5, use average bridge velocity If SBR≥5, use overbank flow velocity
L'	Length of Abutment Projected Normal to Flow, feet	0.00	1.19	2.09	3.18	From HEC-RAS, Section 309
B _f	Width of Floodplain, feet	0.00	1.19	2.09	3.18	Assume L' and B _f Approximately Equal
L' / B _f	If ≥ 0.75 , then Figure 8.7a, assume Live-Bed, use Equation 8.5 If < 0.75 , then Figure 8.7b, assume Clear-Water, use Equation 8.6	1.00	1.00	1.00	1.00	

Contraction Scour Calculation: Live-Bed Live-Bed Live-Bed Live-Bed

Live-Bed Contraction Scour Calculation

Variable		Discharge Frequency (years)				Notes
		10	50	100	200	
y _i	Channel Average Depth at Approach Section, feet	1.58	2.34	2.82	3.41	From HEC-RAS, Section 309
Q _i	Channel Flow through the Approach Section, cfs	150.00	310.00	450.00	540.00	From HEC-RAS, Section 309
W _i	Channel Top Width at the Approach Section, feet	24.04	25.30	25.30	25.30	From HEC-RAS, Section 309
q _i	Unit Discharge at the Approach Section, ft ² /s	6.24	12.25	17.79	21.34	Q _i / W _i
Q ₂	Channel Flow through the Bridge Opening, cfs	150.00	310.00	450.00	540.00	Flow through Bridge, excluding Weir Flow
W ₂	Channel Top Width Inside the Bridge Opening, feet	28.66	28.66	28.66	28.66	Clear span length
q _{2c}	Unit Discharge in the Constricted Opening, ft ² /s	5.23	10.82	15.70	18.84	Q ₂ / W ₂
q _{2c} / q _i		0.84	0.88	0.88	0.88	
a _A	Amplification Factor for Live-Bed Conditions	1.20	1.20	1.20	1.20	Wingwall Abutments (Figure 8.10)
y _c	Flow Depth including Live-Bed Contraction Scour, feet	1.36	2.10	2.53	3.06	Equation 8.5
y _{max}	Maximum Flow Depth resulting from Abutment Scour, feet	1.63	2.52	3.04	3.68	Equation 8.3
y _o	Channel Average Depth Inside the Bridge Opening, feet	3.22	4.45	4.45	4.45	From HEC-RAS, Section 140 BR U
y _s	Live-Bed Contraction Scour Depth, feet =	0.00	0.00	0.00	0.00	(Equation 8.4)
		N/A, Qpress	N/A, Qpress	N/A, Qpress		

Clear-Water Contraction Scour Calculation

Variable		Discharge Frequency (years)				Notes
		10	50	100	200	
D ₅₀	Size of Bed Material, mm	2.74	2.74	2.74	2.74	
q _{2f}	Unit Discharge in the Constricted Opening, ft ² /s	5.23	10.82	15.70	18.84	Q ₂ / W ₂
q _i	Unit Discharge at the Approach Section, ft ² /s	6.24	12.25	17.79	21.34	
q _{2f} / q _i		0.84	0.88	0.88	0.88	
a _B	Amplification Factor for Clear-Water Conditions	1.00	1.00	1.00	1.00	Wingwall Abutments (Figure 8.12)
y _c	Flow Depth including Clear-Water Contraction Scour, feet	2.01	3.74	5.15	6.02	Equation 8.6
y _{max}	Maximum Flow Depth resulting from Abutment Scour, feet	2.01	3.74	5.15	6.02	Equation 8.3
y _o	Channel Average Depth Inside the Bridge Opening, feet	3.22	4.45	4.45	4.45	From HEC-RAS, Section 140 BR U
y _s	Clear-Water Contraction Scour Depth, feet =	N/A	N/A	N/A	N/A	(Equation 8.4)
		N/A, Qpress	N/A, Qpress	N/A, Qpress		

NCHRP 24-20 Abutment Scour- Proposed Mystic Street Bridge
Mystic Street over Mill Brook, Arlington

January 2, 2017

Scour Estimates based on FHWA's HEC-18 (2012) and National Cooperative Highway Research Program's 24-20 Report (2010)

Notes- References are to HEC-18 (2012), Section 8.6.3
Method not applicable to pressure flow conditions.

Abutment #2

Southerly Abutment

Right Abutment looking Downstream

Variable		Discharge Frequency (years)				Notes
		10	50	100	200	
	Set-Back Length, feet	0.00	0.00	0.00	0.00	Assume negligible
	Average Channel Flow Depth, feet	3.22	4.45	4.45	4.45	From HEC-RAS, Section 340 BR U
SBR	Set-Back Ratio: (Set-Back Length)/(Ave. Channel Flow Depth)	0.0	0.0	0.0	0.0	If SBR<5, use average bridge velocity If SBR≥5, use overbank flow velocity
L'	Length of Abutment Projected Normal to Flow, feet	0.00	2.63	3.30	3.30	From HEC-RAS, Section 309
B _f	Width of Floodplain, feet	0.00	2.63	3.30	3.30	Assume L' and B _f Approximately Equal
L' / B _f	If ≥ 0.75 , then Figure 8.7a, assume Live-Bed, use Equation 8.5 If < 0.75 , then Figure 8.7b, assume Clear-Water, use Equation 8.6	1.00	1.00	1.00	1.00	

Contraction Scour Calculation: Live-Bed Live-Bed Live-Bed Live-Bed

Live-Bed Contraction Scour Calculation

Variable		Discharge Frequency (years)				Notes
		10	50	100	200	
y _i	Channel Average Depth at Approach Section, feet	1.58	2.34	2.82	3.41	From HEC-RAS, Section 309
Q _i	Channel Flow through the Approach Section, cfs	150.00	310.00	450.00	540.00	From HEC-RAS, Section 309
W _i	Channel Top Width at the Approach Section, feet	24.04	25.30	25.30	25.30	From HEC-RAS, Section 309
q _i	Unit Discharge at the Approach Section, ft ² /s	6.24	12.25	17.79	21.34	Q _i / W _i
Q ₂	Channel Flow through the Bridge Opening, cfs	150.00	310.00	450.00	540.00	Flow through Bridge, excluding Weir Flow
W ₂	Channel Top Width Inside the Bridge Opening, feet	28.66	28.66	28.66	28.66	Clear span length
q _{2c}	Unit Discharge in the Constricted Opening, ft ² /s	5.23	10.82	15.70	18.84	Q ₂ / W ₂
q _{2c} / q _i		0.84	0.88	0.88	0.88	
a _A	Amplification Factor for Live-Bed Conditions	1.20	1.20	1.20	1.20	Wingwall Abutments (Figure 8.10)
y _c	Flow Depth including Live-Bed Contraction Scour, feet	1.36	2.10	2.53	3.06	Equation 8.5
y _{max}	Maximum Flow Depth resulting from Abutment Scour, feet	1.63	2.52	3.04	3.68	Equation 8.3
y _o	Channel Average Depth Inside the Bridge Opening, feet	3.22	4.45	4.45	4.45	From HEC-RAS, Section 140 BR U
y _s	Live-Bed Contraction Scour Depth, feet =	0.00	0.00	0.00	0.00	(Equation 8.4)
		N/A, Qpress	N/A, Qpress	N/A, Qpress		

N/A, Qpress N/A, Qpress N/A, Qpress

Clear-Water Contraction Scour Calculation

Variable		Discharge Frequency (years)				Notes
		10	50	100	200	
D ₅₀	Size of Bed Material, mm	2.74	2.74	2.74	2.74	
q _{2f}	Unit Discharge in the Constricted Opening, ft ² /s	5.23	10.82	15.70	18.84	Q ₂ / W ₂
q _i	Unit Discharge at the Approach Section, ft ² /s	6.24	12.25	17.79	21.34	
q _{2f} / q _i		0.84	0.88	0.88	0.88	
a _B	Amplification Factor for Clear-Water Conditions	1.00	1.00	1.00	1.00	Wingwall Abutments (Figure 8.12)
y _c	Flow Depth including Clear-Water Contraction Scour, feet	2.01	3.74	5.15	6.02	Equation 8.6
y _{max}	Maximum Flow Depth resulting from Abutment Scour, feet	2.01	3.74	5.15	6.02	Equation 8.3
y _o	Channel Average Depth Inside the Bridge Opening, feet	3.22	4.45	4.45	4.45	From HEC-RAS, Section 140 BR U
y _s	Clear-Water Contraction Scour Depth, feet =	N/A	N/A	N/A	N/A	(Equation 8.4)
		N/A, Qpress	N/A, Qpress	N/A, Qpress		

APPENDIX D: MassDOT Bridge Inspection Reports

**Massachusetts Department of Transportation Structures Inspection Field Reports
for Structure A10015-7XF-MUN-BRI**

<u>REPORT A</u>	<u>ROUTINE INSP. DATE</u>	<u>SPEC. MEMB. INSP. DATE</u>
● Report I	January 26, 2021	July 11, 2022
● Report H	January 26, 2021	Jan. 27, 2022
● Report G	January 26, 2021	July 29, 2021
● Report F	January 16, 2019	July 8, 2020
● Report E	January 16, 2019	Jan 24, 2020
● Report D	January 17, 2017	
● Report C	January 21, 2015	Feb. 29, 2016
● Report B	January 21, 2015	July 27, 2015
● Report A	January 21, 2015	

REPORT I

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 27

2-DIST 04	B.I.N. 7XF	STRUCTURES INSPECTION FIELD REPORT			BR. DEPT. NO. A-10-015
SPECIAL MEMBER INSPECTION					

CITY/TOWN ARLINGTON	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	11-KILO. POINT 000.000	90-ROUTINE INSP. DATE Jan 26, 2021	93*-SPEC. MEMB. INSP. DATE Jul 11, 2022																							
07-FACILITY CARRIED US 3 MYSTIC ST	MEMORIAL NAME/LOCAL NAME	27-YR BUILT 1850	106-YR REBUILT 1958	*YR REHAB'D (NON 106) 0000																							
06-FEATURES INTERSECTED WATER MILL BROOK	26-FUNCTIONAL CLASS Urban Arterial	DIST. BRIDGE INSPECTION ENGINEER <i>J. Dideo</i>																									
43-STRUCTURE TYPE 801 : Masonry Slab	22-OWNER Town Agency	21-MAINTAINER Town Agency	TEAM LEADER D. Y. NG, P.E. <i>D. Y. Ng</i> PE#53324	PROJ MGR Stantec Consulting <i>D.W. Reip</i>																							
107-DECK TYPE 9 : Other	WEATHER Clear	TEMP. (air) 21°C	TEAM MEMBERS E. LARACY																								
WEIGHT POSTING Actual Posting <table border="1"><tr><td>H</td><td>3</td><td>3S2</td><td>Single</td></tr><tr><td>N</td><td>N</td><td>N</td><td>N</td></tr></table> Recommended Posting <table border="1"><tr><td>N</td><td>N</td><td>N</td><td>N</td></tr></table> Waived Date: 00/00/0000 EJDMT Date: 00/00/0000	H	3	3S2	Single	N	N	N	N	N	N	N	N	X	At bridge <table border="1"><tr><td>N</td><td>S</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table> Advance <table border="1"><tr><td>N</td><td>S</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	N	S					N	S					PLANS (Y/N): Y (V.C.R.) (Y/N): N TAPE#:
H	3	3S2	Single																								
N	N	N	N																								
N	N	N	N																								
N	S																										
N	S																										

RATING		If YES please give priority: HIGH () MEDIUM () LOW ()	
Rating Report (Y/N): N	Date: ----	Recommend for Rating or Rerating (Y/N): N	
REASON: Inspection data at time of existing rating 158: - 159: - 160: - 162: - Date: 00/00/0000			

	MEMBER	CRACK (Y/N):	WELD'S CONDITION (0-9)	LOCATION OF CORROSION, SECTION LOSS (%), CRACKS, COLLISION DAMAGE, STRESS CONCENTRATION, ETC.	CONDITION		INV. RATING OF MEMBER FROM RATING ANALYSIS			Deficiencies
					PREVIOUS (0-9)	PRESENT (0-9)	H-20	3	3S2	
A	Item 58.2 - Deck Condition	N	N	See remarks in comments section.	3	3				S-A
B	Item 59.4 - Girders or Beams	N	N	See remarks in comments section.	3	3				S-A
C	Item 60.1.d - Breastwalls	N	N	See remarks in comments section.	4	4				S-A
D										
E										

List of field tests performed:	I-58	I-59	I-60	I-62
	3	3	4	-
	(Overall Previous Condition)			
	3	3	4	-
	(Overall Current Condition)			

DEFICIENCY:	A defect in a structure that requires corrective action.
CATEGORIES OF DEFICIENCIES:	
M= Minor Deficiency	Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion of steel, Minor scouring, Clogged drainage, etc.
S= Severe/Major Deficiency	Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroded rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.
C-S= Critical Structural Deficiency	A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.
C-H= Critical Hazard Deficiency	A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.

URGENCY OF REPAIR:	
I= Immediate-	[Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the deficiency and to receive further instruction from him/her].
A= ASAP-	[Action/Repair should be initiated by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) upon receipt of the Inspection Report].
P= Prioritize-	[Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

X=UNKNOWN N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 11, 2022
REMARKS				
BRIDGE ORIENTATION				
Bridge A-10-015 (7XF) carries Mystic Street (US 3) over Mill Brook in the Town of Arlington, MA. Traffic on Mystic Street travels in the north/south direction and Mill Brook flows from west to east. The bridge is oriented in the north-south direction with abutments labeled north & south, sidewalk superstructures labeled east & west, and spans numbered 1 & 2 from the south. The reinforced concrete slabs, granite slabs, & steel beams which make up the main roadway superstructures are numbered from west to east per span. For a location map, see Sketch 1.				
GENERAL REMARKS				
The bridge consists of two spans comprised of reinforced concrete slabs, granite slabs, & steel beams. The granite slabs are from the original construction (estimated 1850) and the reinforced concrete slabs are from a widening project in 1958. The steel beams, which appear to be flanged T-rails, were added at an unknown date.				
The substructure consists of stone masonry abutments and a pier. The east and west sidewalks extend beyond the limits of the original abutments and are supported by separate concrete abutments and transverse sidewalk beams with columns.				
For general details, see Sketches 2 through 4. For general views of the bridge, see Photos 1 through 4.				
ACCESS REMARKS				
The bridge was inspected on 7/11/22 and was accessed from the northwest embankment. Depth of water at the time of inspection was maximum 17". Chest waders are recommended due to low clearance under structure.				
The bridge is located at coordinates 42.41870, -71.15143.				
ITEM 58 - DECK				
Item 58.2 - Deck Condition				
There is a reinforced concrete slab between the sidewalk and fascia beams at the east and west ends of the bridge, (4) reinforced concrete slabs in Span 1, and (2) reinforced concrete slabs in Span 2.				
The reinforced concrete slabs have areas of scaling with shallow rebar, longitudinal hairline cracks, efflorescence, rust staining, areas of delamination, and spalls containing exposed steel beams/rebar with section loss. For a complete list of reinforced concrete slab deficiencies, refer to Sketches 5 & 6 and Photos 5 through 7.				
The most significant (S/A) deficiencies are as follows:				
Span 1				
- (S/A Deficiency) Concrete Slab #3, west end at south abutment, 3'-0" long x 18" wide x 11" deep spall/void at interface with granite slab exposing original granite curb stones, refer to Photo 5 & Note 16 on Sketch 5.				
- (S/A Deficiency) Concrete Slab #3, west end at pier, 16" long x 8" wide x 8" deep spall/void at interface with granite slab, refer to Photo 6 & Note 17 on Sketch 5.				
Span 2				

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 11, 2022
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REMARKS

- (S/A Deficiency) Concrete Slab #2, east end at north abutment, 22" wide x 22" long x 3.5" deep spall containing (4) heavily corroded transverse bars with up to 90% section loss; adjacent 32" long x 20" wide area of delamination to the south, refer to Photo 7 & Note 40 on Sketch 6.

ITEM 59 - SUPERSTRUCTURE**Item 59.4 - Girders or Beams**

Span 1 consists of (10) granite slabs and (4) steel flanged T-rails. Span 2 consists of (11) granite slabs and (14) steel flanged T-rails. The steel beams are closely spaced together with brick infill so only the bottom flange is accessible for inspection. At the sidewalks, there is a reinforced concrete fascia beam and interior sidewalk beam supported near midspan by a transverse sidewalk beam and reinforced concrete column.

At the west elevation, the Transverse Sidewalk Beam near the pier has a 42" long x 12" high x 4" deep spall with an adjacent 10" high area of delamination on the south face, refer to Photo 8. On the north face, there is a 48" long x 6" high spall extending 8" onto the bottom face exposing rebar with an adjacent 42" long x 6" high area of delamination, refer to Photo 9.

The granite slabs have locations of longitudinal hairline cracks, transverse cracks up to 5/16" wide, split sections, areas of active leakage between joints. The steel beams exhibit moderate to heavy corrosion with locations of efflorescence and section loss. The concrete beams have longitudinal cracks up to 1/2" wide, rust stains, efflorescence, hairline map cracks, areas of scaling, delamination, and spalls with exposed rebar. Several locations of exposed rebar exhibit up to 90% section loss or broken bars. For a complete list of granite slab, steel beam, and concrete beam deficiencies, refer to Sketches 5 & 6 and Photos 10 through 24.

The most significant (S/A) deficiencies are as follows:

Granite Slabs

- (S/A Deficiency) Span 1, Granite Slab #9, 3'-0" long hairline crack at south abutment, refer to Photo 10 & Note 14 on Sketch 5.

- (S/A Deficiency) Span 1, Granite Slab #10, full width transverse hairline crack at midspan, refer to Photo 11 & Note 15 on Sketch 5.

- (S/A Deficiency) Span 2, Granite Slab #1, 3'-0" long hairline crack at the north and 12" long hairline crack at the south, refer to Notes 31 & 32 on Sketch 6.

- (S/A Deficiency) Span 2, Granite Slab #6, full width 5/16" wide transverse crack at midspan which extends up to full visible height on both vertical faces; a crack gauge has been installed on the east face, refer to Photo 12 & Note 36 on Sketch 6.

- (S/A Deficiency) Span 2, Granite Slab #8, full width 1/8" wide transverse crack at midspan, refer to Photo 13 & Note 37 on Sketch 6.

- (S/A Deficiency) Span 2, Granite Slab #10, northwest corner, 4" long x 2" wide x 5" high split section, refer to Photo 14 & Note 38 on Sketch 6.

Steel Beams

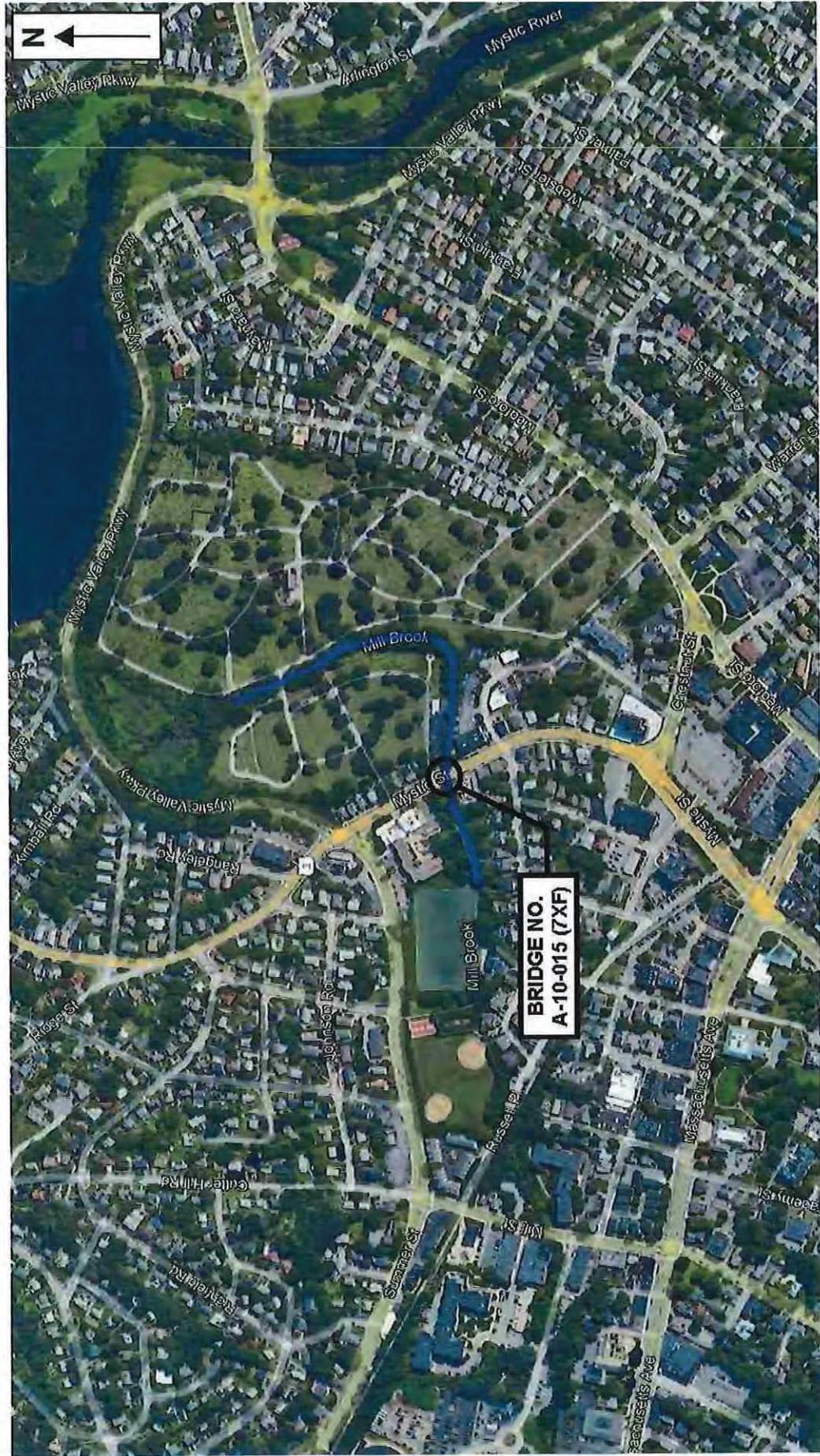
- (S/A Deficiency) Span 1, Steel Beam #1, west bottom flange with heavy corrosion and a 10" long section of knife edge mid span and a 3" long section of knife edge at the quarter point, refer to Photo 15 & 16 and Note 11 on Sketch 5.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 11, 2022
REMARKS				
<p>- (S/A Deficiency) Span 2, Steel Beam #14, east bottom flange with heavy corrosion and full-length knife edge, refer to Photo 18 & Note 34 on Sketch 6.</p> <p><u>Concrete Beams</u></p> <p>- (S/A Deficiency) Span 1, West Fascia Beam, there is a full length 12" high x 8" deep (max.) spall containing exposed rebar with up to 75% section loss along the top west edge, refer to Photo 1 & Note 1 on Sketch 5.</p> <p>- (S/A Deficiency) Span 1, West Sidewalk Beam, there is a full length, full width by 5" deep (max.) spall containing exposed transverse and longitudinal rebar with up to 50% section loss on the underside. (1) transverse bar is broken at midspan and there is active water leakage, refer to Photo 19 & Note 7 on Sketch 5.</p> <p>- (S/A Deficiency) Span 2, West Fascia Beam, there is a full length, full height (max.) spall with exposed longitudinal bars and stirrups on the west face. Stirrups have up to 90% section loss. Spall extends up to 16" deep at the top edge, 12" deep on the bottom edge, and is undermining the railing above, refer to Photo 1 & 22 and Note 24 on Sketch 6.</p> <p>- (S/A Deficiency) Span 2, West Sidewalk Beam, there is a full length by full height area of scaling with a 4'-0" long 1/8" wide longitudinal crack with rust stains along the bottom edge at the west face, refer to Photo 23 & Note 28 on Sketch 6. In addition, there is a 5'-6" long x full width x 4.5" deep spall containing (5) exposed transverse bars and (2) exposed longitudinal bars with up to 25% section loss along the bottom face, refer to Photo 24 & Note 29 on Sketch 6. To the north of the spall, there is an adjacent 24" long x full width area of delamination.</p>				
ITEM 60 - SUBSTRUCTURE				
<p><u>Item 60.1 - Abutments</u></p> <p><u>Item 60.1.d - Breastwalls</u></p> <p>The breastwalls exhibit scattered voids up to 30" deep due to deteriorated mortar and missing chinking stones typically at the waterline and near drainpipe outfalls. There are several locations with cracked and undermined stones. For a complete list of breastwall deficiencies, refer to Sketch 7 and Photos 25 through 28.</p> <p>The most significant (S/A) deficiencies are as follows:</p> <p><u>North Breastwall</u></p> <p>- (S/A Deficiency) West end below Concrete Slab #1, 5'-6" wide x 9" high x 2'-0" deep (max.) void due to missing stones undermining stone above, refer to Photo 26 & Note E on Sketch 7.</p> <p>- (S/A Deficiency) Center below Granite Slab #5, 18" wide x 12" high x 16" deep (max.) void and an adjacent 16" wide x 16" high x 11" deep (max.) void due to missing stones with two cracked stones above, refer to Photo 27 & Note H on Sketch 7.</p> <p>- (S/A Deficiency) East end below Concrete Slab #2, 3'-0" wide x 30" high x 30" deep (max.) void area at drain pipe due to missing stones and deteriorated mortar; drain pipe is fractured, refer to Photo 28 & Note K on Sketch 7.</p> <p><u>Sketch / Photo Log</u></p> <p>Sketch 1 : A-10-015 (7XF) - Location Map</p>				

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REMARKS				
Sketch 2 :	A-10-015 (7XF) - General Plan			
Sketch 3 :	A-10-015 (7XF) - General Elevations			
Sketch 4 :	A-10-015 (7XF) - Typical Sections			
Sketch 5 :	Underside Deficiencies 1 of 2 (Span 1)			
Sketch 6 :	Underside Deficiencies 2 of 2 (Span 2)			
Sketch 7 :	Breastwall Deficiencies			
Photo 1 :	A-10-015 (7XF) - West Elevation			
Photo 2 :	A-10-015 (7XF) - East Elevation			
Photo 3 :	A-10-015 (7XF) - General view of Span 1 underside, looking east.			
Photo 4 :	A-10-015 (7XF) - General view of Span 2 underside, looking east.			
Photo 5 :	Deck - Span 1, Concrete Slab #3, west end at south abutment, spall/void at interface with granite slab exposing original granite curb stones.			
Photo 6 :	Deck - Span 1, Concrete Slab #3, west end at pier, spall/void at interface with granite slab.			
Photo 7 :	Deck - Span 2, Concrete Slab #2, northeast corner, spall containing exposed rebar with section loss and adjacent area of delamination to the south.			
Photo 8 :	Girders/Beams - West Transverse Sidewalk Beam near pier, south face with areas of spalling and delamination.			
Photo 9 :	Girders/Beams - West Transverse Sidewalk Beam near pier, north face with areas of spalling, delamination, and exposed rebar.			
Photo 10 :	Girders/Beams - Span 1, Granite Slab #9, looking south, longitudinal hairline crack at south abutment.			
Photo 11 :	Girders/Beams - Span 1, Granite Slab #10, full width transverse hairline crack at midspan.			
Photo 12 :	Girders/Beams - Span 2, Granite Slab #6, full width 5/16" transverse crack at midspan extending up vertical faces; crack gauge at east face.			
Photo 13 :	Girders/Beams - Span 2, Granite Slab #8, full width 1/8" transverse crack at midspan.			
Photo 14 :	Girders/Beams - Span 2, Granite Slab #10, split section at northwest corner.			
Photo 15 :	Girders/Beams - Span 1, Steel Beam #1, west bottom flange at midspan, 10" long section of knife edge.			
Photo 16 :	Girders/Beams - Span 1, Steel Beam #1, heavy corrosion with sections of knife edge at west side of bottom flange. Note moderate corrosion on adjacent beams to the east.			
Photo 17 :	Girders/Beams - Span 1, Steel Beam #2, west bottom flange near midspan, minor section loss.			
Photo 18 :	Girders/Beams - Span 2, Steel Beam #14, east bottom flange, heavy corrosion with full length knife edge.			
Photo 19 :	Girders/Beams - Span 1, West Sidewalk Beam, bottom face looking south, spall with exposed rebar and active water leakage. Note broken stirrup and section loss to bars.			
Photo 20 :	Girders/Beams - Span 1, East Sidewalk Beam, bottom face looking north, area of delamination with rust stains and longitudinal hairline cracks.			
Photo 21 :	Girders/Beams - Span 1, East face of East Sidewalk Beam looking west, full length longitudinal crack with rust stains near bottom edge.			
Photo 22 :	Girders/Beams - Span 2, West face of West Fascia Beam, significant spalling with exposed rebar undermining railing. Note significant section loss to stirrups.			
Photo 23 :	Girders/Beams - Span 2, West face of West Sidewalk Beam, typical full height scaling and longitudinal crack with rust stains near bottom edge.			
Photo 24 :	Girders/Beams - Span 2, West Sidewalk Beam, bottom face looking north, spall containing exposed rebar with section loss.			
Photo 25 :	Breastwall - South breastwall at west end, area of voids due to missing stones between and below drain pipes.			
Photo 26 :	Breastwall - North breastwall at west end, area of voids due to missing stones undermining stones above.			

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REMARKS				
<p>Photo 27 : Breastwall - North breastwall near center under Granite Slab #5, area of voids due to missing stones with cracked stones above.</p> <p>Photo 28 : Breastwall - North breastwall at east end, void at drain pipe due to missing stones and deteriorated mortar. Note drain pipe is fractured.</p>				

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INSPECTION DATE
JUL 11, 2022**SKETCHES**

Sketch 1: A-10-015 (7XF) - Location Map

CITY/TOWN
ARLINGTON

B.I.N.
7XF

BR. DEPT. NO.
A-10-015

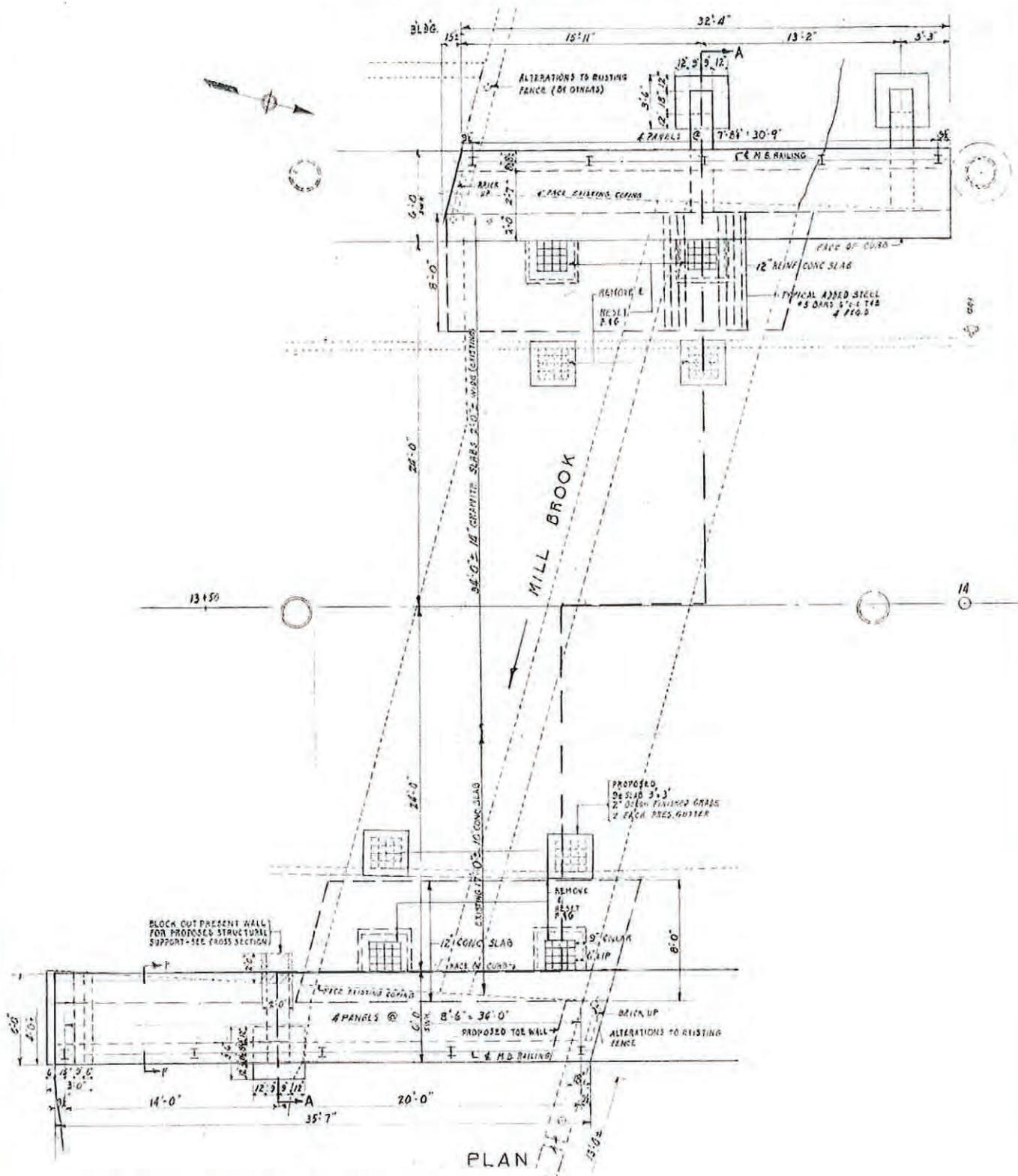
8.-STRUCTURE NO.

A10015-7XF-MUN-BRI

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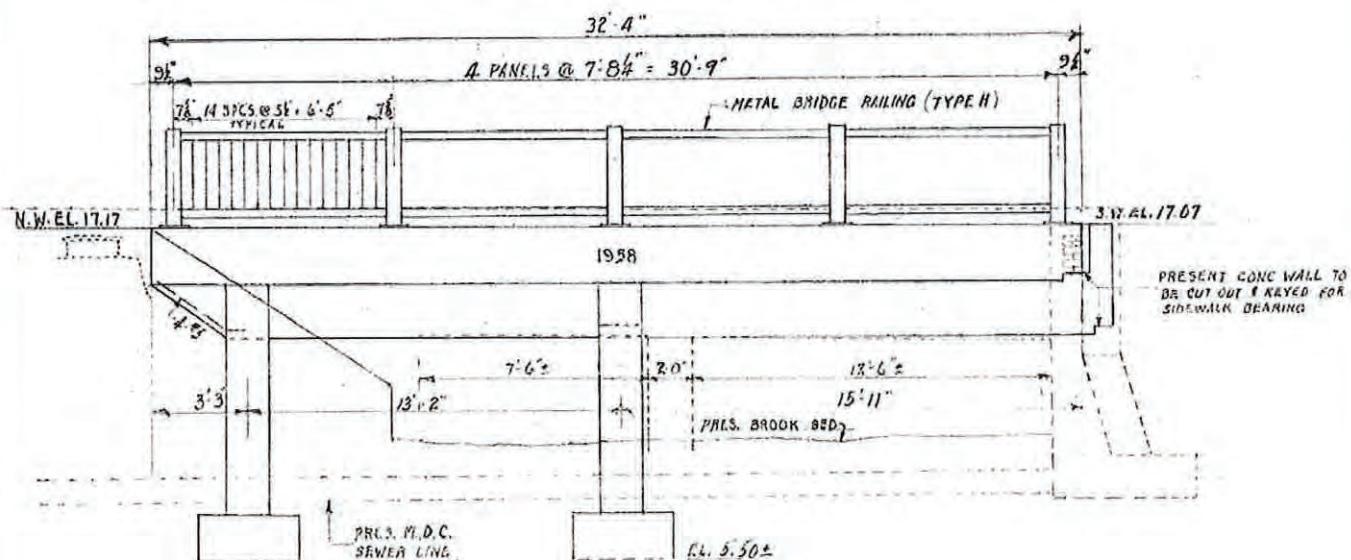
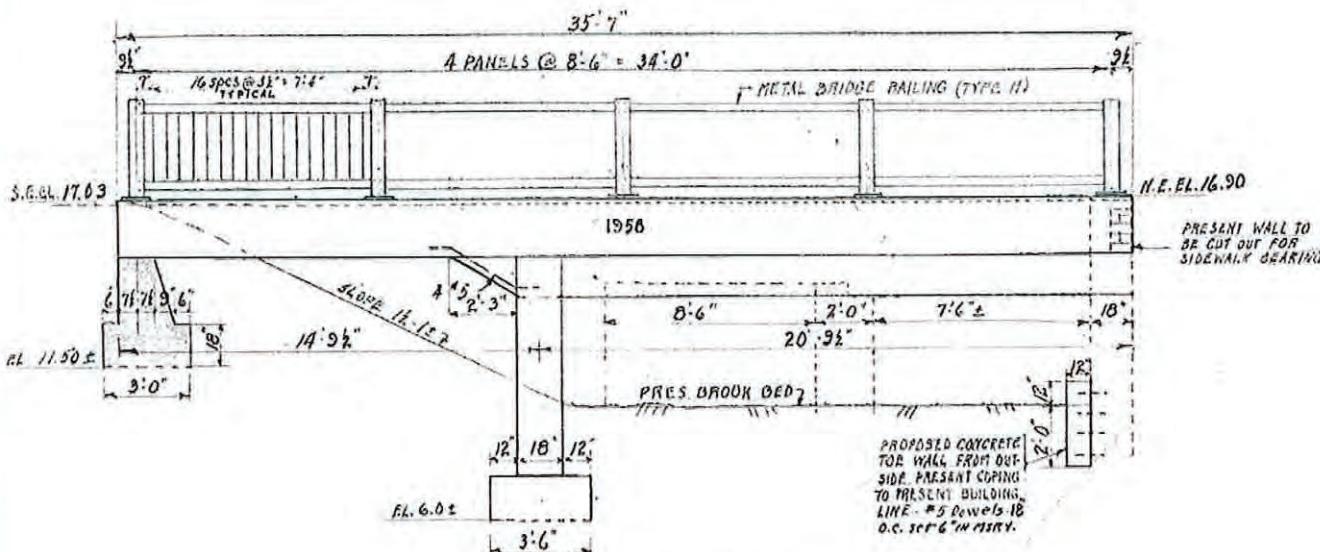
JUL 11, 2022

SKETCHES



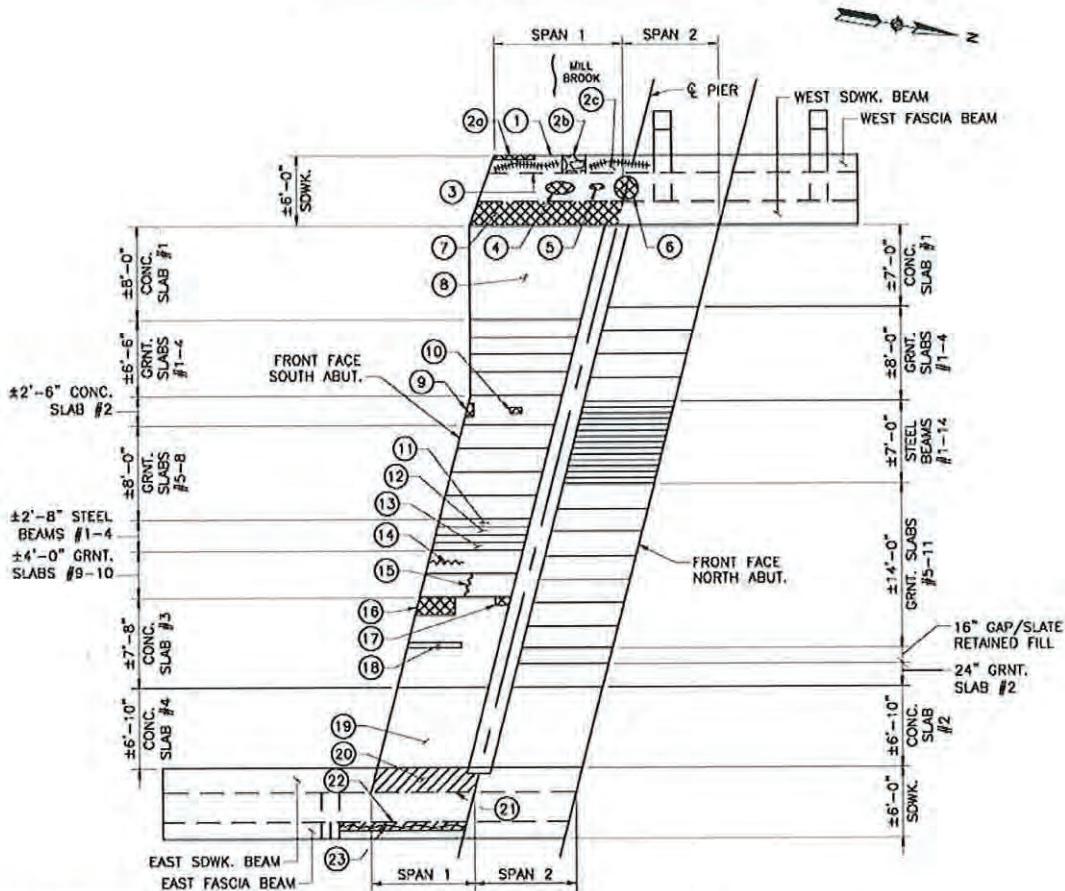
Sketch 2: A-10-015 (7XF) - General Plan

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 11, 2022
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SKETCHESSketch 3: **A-10-015 (7XF) - General Elevations**

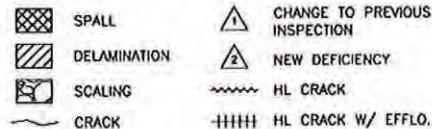
CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 11, 2022
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SKETCHES



LEGEND / ABBREVIATIONS

ABUT.	- ABUTMENT	HVY.	- HEAVY	FL	- FULL LENGTH
CONC.	- CONCRETE	LONG.	- LONGITUDINAL	FW	- FULL WIDTH
DELAM.	- DELAMINATION	MOD.	- MODERATE	L	- LONG
EFFLO.	- EFFLORESCENCE	SCAT.	- SCATTERED	W	- WIDE
EXP.	- EXPOSED	SDWK.	- SIDEWALK	H	- HIGH
GRNT.	- GRANITE	TRANS.	- TRANSVERSE	D	- DEEP
HL	- HAIRLINE	W/	- WITH		

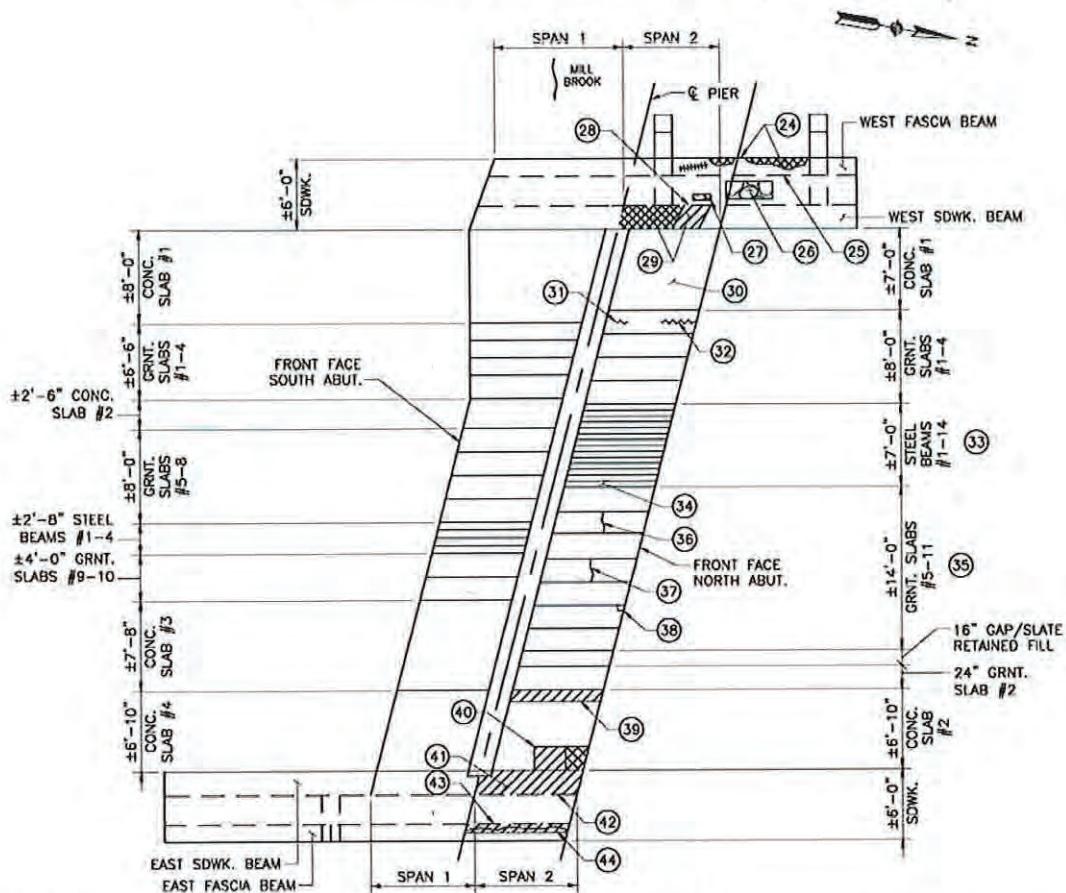


- SPAN 1**
- △ (S/A) 1. WEST FASCIA BEAM, TOP WEST EDGE, FL x 12'H x 8'D (MAX.) SPALL W/ EXP. REBAR; REBAR W/ UP TO 75% SECTION LOSS. (PHOTO 1)
- △ 2. WEST FASCIA BEAM, BOTTOM FACE:
A) 42'L x 2'W x 3'H (MAX.) CORNER SPALL.
B) 24'L x FW (MAX.) x 2'D (MAX.) AREA OF SCALING.
C) MULTIPLE LONG. HL CRACKS W/ HVY. EFFLO. & ADJACENT AREAS OF DELAM.
- △ 3. WEST FASCIA BEAM, SOUTH HALF OF EAST FACE, MOD. TO HVY. SCALING UP TO 2'D W/ MAP CRACKS, RUST STAINS, & SHALLOW REBAR.
- △ 4. WEST SDWK DECK, 24'L x 12'W x 2'D SPALL W/ (2) TRANS. BAR EXP.
- △ 5. WEST SDWK DECK, 5'L x 12'W x 2'D SPALL W/ (1) TRANS. BAR EXP.
- △ 6. WEST SDWK DECK, 24'L x 24'W x 2'D SPALL W/ (4) TRANS. & (1) LONG. BARS EXP.
- △ (S/A) 7. WEST SDWK BEAM, FL x FW x 5'D (MAX.) SPALL W/ EXP. TRANS. & LONG. BARS; UP 50% SECTION LOSS TO BARS, (1) TRANS. BAR BROKEN @ MIDSPAN, & ACTIVE WATER LEAKAGE. (PHOTO 19)
- △ 8. CONC. SLAB #1, SCAT. RUST STAINS & FORMWORK LEFT IN PLACE.
- △ 9. CONC. SLAB #2, 9'L x 14'W x 1.5'D SPALL W/ EXP. BOTTOM FLANGE.
10. CONC. SLAB #2, 10'L x 4'W x 1.5'D SPALL W/ EXP. BOTTOM FLANGE.
- △ (S/A) 11. BEAM #1, WEST BOTTOM FLANGE, HVY. CORROSION W/ 10'L KNIFE EDGE @ MIDSPAN & 3'L KNIFE EDGE @ 1/4 PT. (PHOTO 15 & 16)
- △ 12. BEAM #2, MOD. CORROSION W/ UP TO 1/16" LOSS ON WEST BOTTOM FLANGE. (PHOTO 17)
13. BEAM #4, MOD. CORROSION & EFFLO. W/ UP TO 1/16" LOSS ON EAST BOTTOM FLANGE.
- (S/A) 14. GRANITE SLAB #9, 3'L LONG. HL CRACK @ SOUTH ABUT. (PHOTO 10)
- (S/A) 15. GRANITE SLAB #10, FW TRANS. HL CRACK @ MIDSPAN. (PHOTO 11)
- (S/A) 16. CONC. SLAB #3, 36'L x 18'W x 11'D SPALL/VOID @ INTERFACE W/ GRANITE SLAB EXPOSING ORIGINAL GRANITE CURB STONES. (PHOTO 5)
- (S/A) 17. CONC. SLAB #3, 16'L x 8'W x 8'D SPALL/VOID @ INTERFACE W/ GRANITE SLAB. (PHOTO 6)
18. CONC. SLAB #3, 56'L x 5'W FORMWORK LEFT IN PLACE.
- △ 19. CONC. SLAB #4, SCAT. RUST STAINING.
- △ 20. EAST SDWK BEAM, FL x FW (MAX.) DELAM. W/ RUST STAINS & LONG. HL CRACKS. (PHOTO 20)
21. EAST SDWK BEAM, EAST FACE, FL LONG. CRACK @ BOTTOM EDGE UP TO 1/2" WIDE W/ RUST STAINING. (PHOTO 21)
22. EAST FASCIA BEAM, WEST FACE, LOWER 6" W/ HVY. SCALING & FL LONG. CRACK UP TO 1/2" WIDE.
- △ 23. EAST FASCIA BEAM, FL x 9'W DELAM. W/ RUST STAINS CONTAINING A FL LONG. CRACK UP TO 1/16" WIDE.

Sketch 5: Underside Deficiencies 1 of 2 (Span 1)

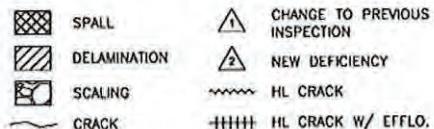
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SKETCHES



LEGEND / ABBREVIATIONS

ABUT.	- ABUTMENT	HVY.	- HEAVY	FL	- FULL LENGTH
CONC.	- CONCRETE	LONG.	- LONGITUDINAL	FW	- FULL WIDTH
DELAM.	- DELAMINATION	MOD.	- MODERATE	L	- LONG
EFFLO.	- EFFLORESCENCE	SCAT.	- SCATTERED	W	- WIDE
EXP.	- EXPOSED	SDWK.	- SIDEWALK	H	- HIGH
GRNT.	- GRANITE	TRANS.	- TRANSVERSE	D	- DEEP
HL	- HAIRLINE	W/	- WITH		



- SPAN 2**
- (S/A) 24. WEST FASCIA BEAM, WEST FACE, FL x FH (MAX.) SPALL W/ EXP. LONG. BARS & STIRRUPS; STIRRUPS W/ UP TO 90% SECTION LOSS; SPALL EXTENDS UP TO 16'D ON TOP FACE & 12'D ON BOTTOM FACE; SPALL UNDERMINES RAILING ABOVE. (PHOTO 22)
25. WEST FASCIA BEAM, EAST FACE, 95'L x FH (MAX.) MOD. TO HVY. SCALING W/ HL MAP CRACKS; SCALING EXTENDS UP TO 3" ON UNDERSIDE.
- (S/A) 26. WEST SDWK. DECK, 48'L x 16"W AREA SCALING.
27. WEST SDWK. DECK, 18'L x 7"W x 1'D (MAX.) HVY. SCALING W/ SHALLOW REBAR.
- (S/A) 28. WEST SDWK. BEAM, WEST FACE, FL x FH SCALING; 18'L x 1/8"W LONG. CRACK W/ RUST STAINS ALONG BOTTOM EDGE. (PHOTO 23)
- (S/A) 29. WEST SDWK. BEAM, 65'L x FW x 4.5"D SPALL W/ (5) TRANS. & (2) LONG. BARS EXP.; UP TO 25% SECTION LOSS TO BARS; ADJACENT 24'L x FW DELAM. (PHOTO 24)
- (S/A) 30. CONC. SLAB #1, SCAT. LONG. HL CRACKS & RUST STAINS.
- (S/A) 31. GRANITE SLAB #1, 12'L LONG. HL CRACK
- (S/A) 32. GRANITE SLAB #1, 36'L LONG. HL CRACK
- (S/A) 33. BEAM #1-7, 9, & 10 W/ MOD. CORROSION TO BOTTOM FLANGE.
- (S/A) 34. BEAM #14, EAST BOTTOM FLANGE, HVY. CORROSION W/ FL KNIFE EDGE. (PHOTO 18)
- (S/A) 35. ACTIVE LEAKAGE @ JOINTS BETWEEN GRANITE SLABS #5-11
- (S/A) 36. GRANITE SLAB #6, FW x 5/16"W TRANS. CRACK @ MIDSPAN WHICH EXTENDS UP TO FULL HEIGHT ON BOTH VERTICAL FACES; CRACK GAUGE INSTALLED ON EAST FACE. (PHOTO 12)
- (S/A) 37. GRANITE SLAB #8, FW x 1/8"W TRANS. CRACK @ MIDSPAN. (PHOTO 13)
- (S/A) 38. GRANITE SLAB #10, 4'L x 2"W x 5'H SPLIT SECTION. (PHOTO 14)
39. CONC. SLAB #2, FL x 12'W DELAM. W/ LONG. HL CRACKS, EFFLO. & RUST STAINS.
- (S/A) 40. CONC. SLAB #2, 22'L x 22"W x 3.5"D SPALL W/ (4) EXP. TRANS. BARS; UP TO 90% SECTION LOSS TO BARS; ADJACENT 32'L x 20"W DELAM. (PHOTO 7)
- (S/A) 41. EAST SDWK BEAM, FL x FW (MAX.) DELAM. W/ RUST STAINS & LONG. HL CRACKS.
42. EAST SDWK BEAM, EAST FACE, FL LONG. CRACK @ BOTTOM EDGE UP TO 1/2" WIDE W/ RUST STAINING. (PHOTO 21)
43. EAST FASCIA BEAM, WEST FACE, LOWER 6" W/ HVY. SCALING & FL LONG. CRACK UP TO 1/2" WIDE.
- (S/A) 44. EAST FASCIA BEAM, FL x 9"W DELAM. W/ RUST STAINS CONTAINING A FL LONG. CRACK UP TO 1/16" WIDE.

Sketch 6: Underside Deficiencies 2 of 2 (Span 2)

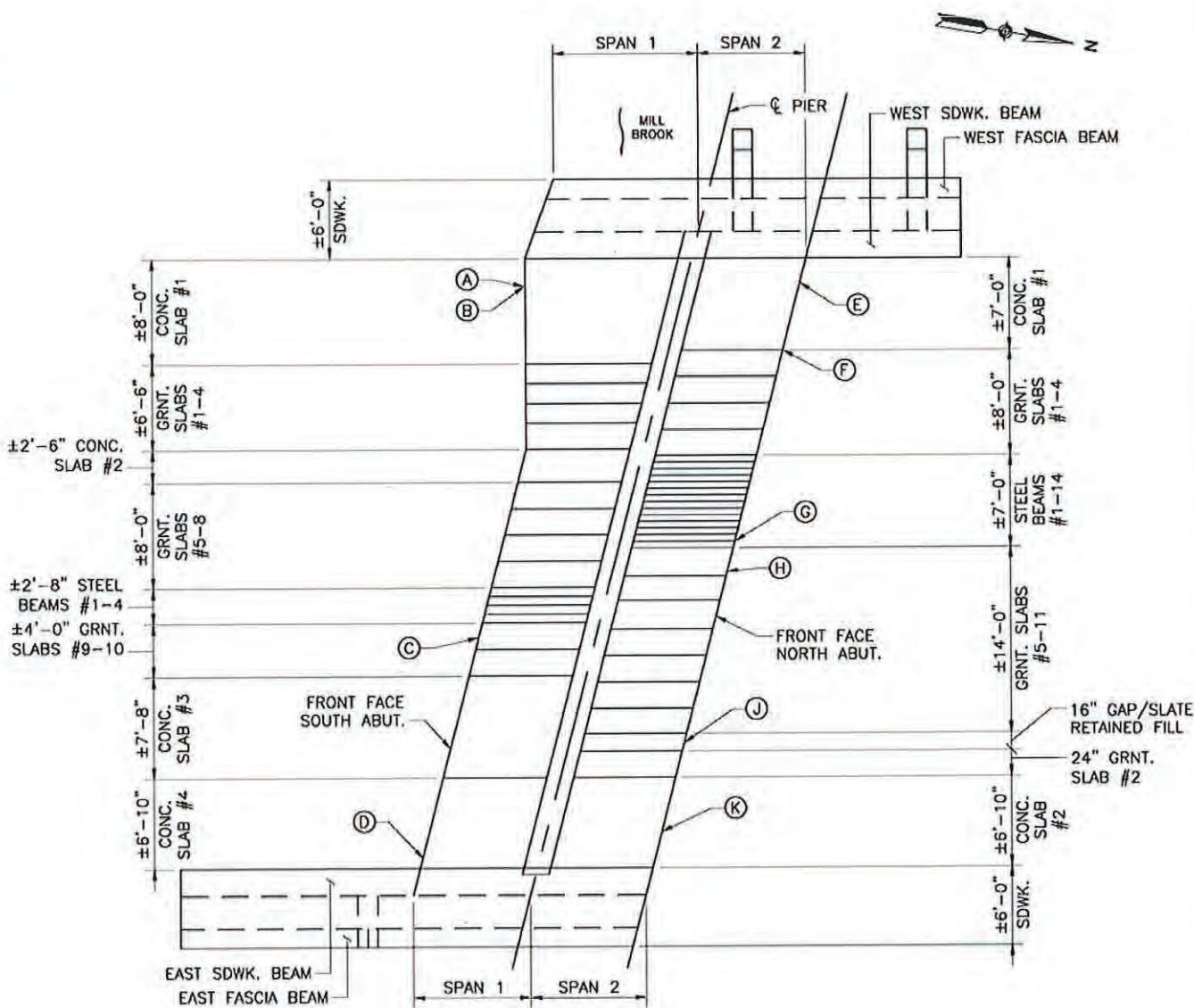
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SKETCHES

SOUTH BREASTWALL

- A. 18"W x 10"H x 16"D (MAX.) VOID BELOW PIPE. (PHOTO 25)
- ⚠️ B. 9"H x 9"W x 30"D (MAX.) VOID BETWEEN PIPES. (PHOTO 25)
- ⚠️ C. 27"W x 7"H x 30"D (MAX.) VOID UNDERMINING STONE.
- D. DETERIORATED MASONRY & MORTAR.

NORTH BREASTWALL

- ⚠️ (S/A) E. 66"W x 9"H x 24"D (MAX.) VOID UNDERMINING STONE. (PHOTO 26)
- F. 30"W x 6"H (MAX.) x 18"D (MAX.) VOID; ADJACENT 8"W x 12"H (MAX.) x 12"D (MAX.) VOID. (PHOTO 26)
- G. 30"W x 6"H x 14"D (MAX.) VOID.
- ⚠️ (S/A) H. 18"W x 12"H x 16"D (MAX.) VOID W/ CRACKED STONES ABOVE & ADJACENT 16"W x 16"H x 11"D (MAX.) VOID TO EAST. (PHOTO 27)
- J. 18"W x 18"H (MAX.) x 20"D (MAX.) VOID UNDERMINING STONE.
- ⚠️ (S/A) K. 36"W x 30"H x 30"D (MAX.) VOID AROUND FRACTURED DRAIN PIPE. (PHOTO 28)

LEGEND / ABBREVIATIONS

ABUT.	-	ABUTMENT
SDWK.	-	CONCRETE
GRNT.	-	GRANITE
SDWK.	-	SIDEWALK
W	-	WIDE
H	-	HIGH
D	-	DEEP
⚠️	CHANGE TO PREVIOUS INSPECTION	
⚠️	NEW DEFICIENCY	

Sketch 7: Breastwall Deficiencies

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 11, 2022
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PHOTOS

Photo 1: A-10-015 (7XF) - West Elevation



Photo 2: A-10-015 (7XF) - East Elevation

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PHOTOS

Photo 3: A-10-015 (7XF) - General view of Span 1 underside, looking east.



Photo 4: A-10-015 (7XF) - General view of Span 2 underside, looking east.

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PHOTOS

Photo 5: Deck - Span 1, Concrete Slab #3, west end at south abutment, spall/void at interface with granite slab exposing original granite curb stones.



Photo 6: Deck - Span 1, Concrete Slab #3, west end at pier, spall/void at interface with granite slab.

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PHOTOS

Photo 7: Deck - Span 2, Concrete Slab #2, northeast corner, spall containing exposed rebar with section loss and adjacent area of delamination to the south.



Photo 8: Girders/Beams - West Transverse Sidewalk Beam near pier, south face with areas of spalling and delamination.

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PHOTOS

Photo 9: Girders/Beams - West Transverse Sidewalk Beam near pier, north face with areas of spalling, delamination, and exposed rebar.



Photo 10: Girders/Beams - Span 1, Granite Slab #9, looking south, longitudinal hairline crack at south abutment.

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PHOTOS



Photo 11: Girders/Beams - Span 1, Granite Slab #10, full width transverse hairline crack at midspan.



Photo 12: Girders/Beams - Span 2, Granite Slab #6, full width 5/16" transverse crack at midspan extending up vertical faces; crack gauge at east face.

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PHOTOS

Photo 13: Girders/Beams - Span 2, Granite Slab #8, full width 1/8" transverse crack at midspan.



Photo 14: Girders/Beams - Span 2, Granite Slab #10, split section at northwest corner.

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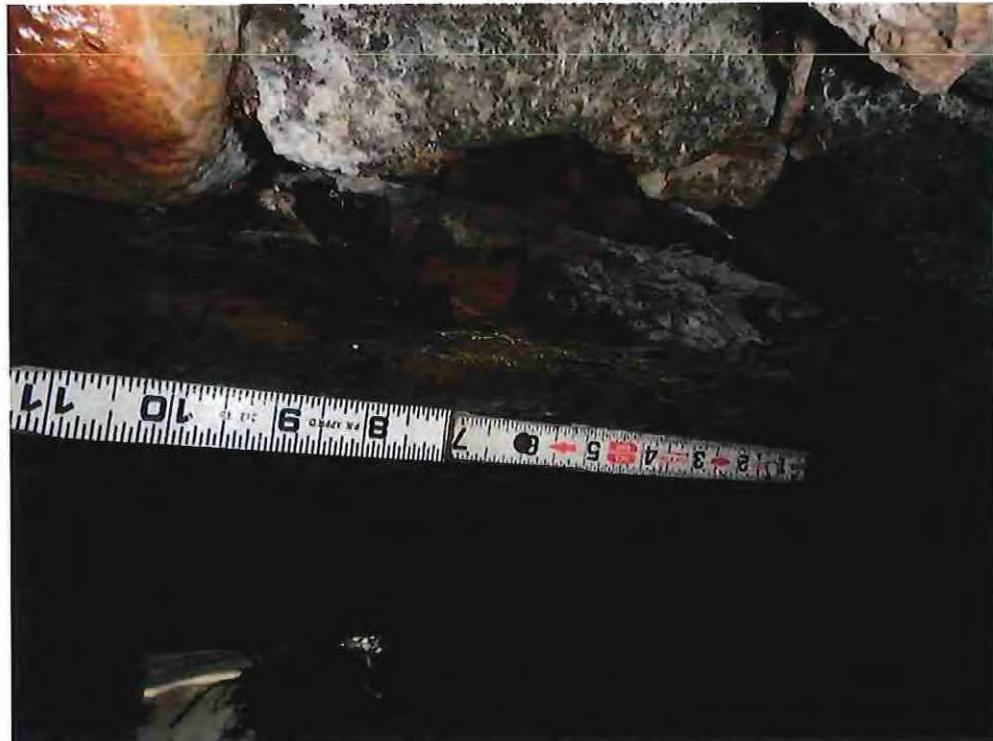
PHOTOS

Photo 15: Girders/Beams - Span 1, Steel Beam #1, west bottom flange at midspan, 10" long section of knife edge.

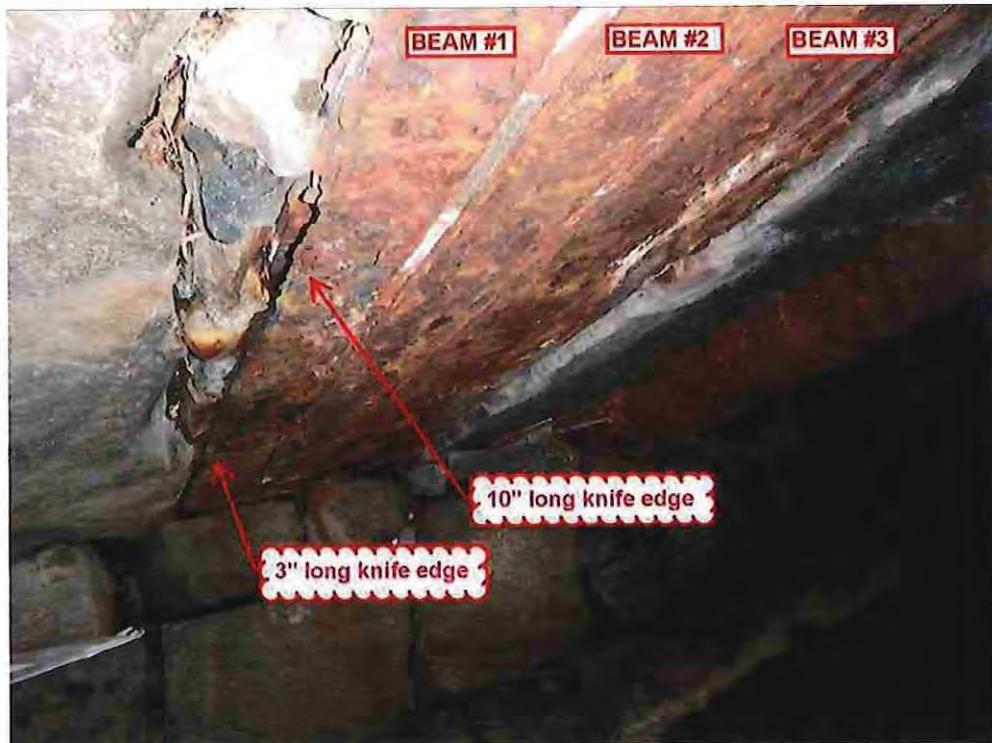


Photo 16: Girders/Beams - Span 1, Steel Beam #1, heavy corrosion with sections of knife edge at west side of bottom flange. Note moderate corrosion on adjacent beams to the east.

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PHOTOS



Photo 17: Girders/Beams - Span 1, Steel Beam #2, west bottom flange near midspan, minor section loss.



Photo 18: Girders/Beams - Span 2, Steel Beam #14, east bottom flange, heavy corrosion with full length knife edge.

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PHOTOS

Photo 19: Girders/Beams - Span 1, West Sidewalk Beam, bottom face looking south, spall with exposed rebar and active water leakage. Note broken stirrup and section loss to bars.



Photo 20: Girders/Beams - Span 1, East Sidewalk Beam, bottom face looking north, area of delamination with rust stains and longitudinal hairline cracks.

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PHOTOS

Photo 21: Girders/Beams - Span 1, East face of East Sidewalk Beam looking west, full length longitudinal crack with rust stains near bottom edge.



Photo 22: Girders/Beams - Span 2, West face of West Fascia Beam, significant spalling with exposed rebar undermining railing. Note significant section loss to stirrups.

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PHOTOS

Photo 23: Girders/Beams - Span 2, West face of West Sidewalk Beam, typical full height scaling and longitudinal crack with rust stains near bottom edge.



Photo 24: Girders/Beams - Span 2, West Sidewalk Beam, bottom face looking north, spall containing exposed rebar with section loss.

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PHOTOS



Photo 25: Breastwall - South breastwall at west end, area of voids due to missing stones between and below drain pipes.



Photo 26: Breastwall - North breastwall at west end, area of voids due to missing stones undermining stones above.

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PHOTOS

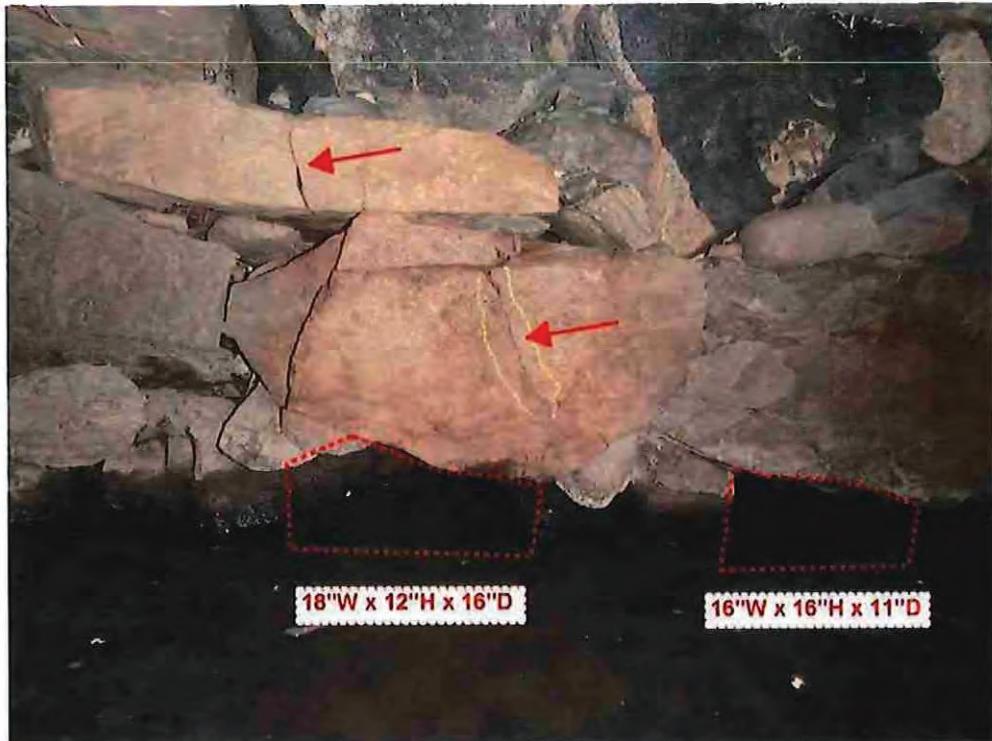


Photo 27: Breastwall - North breastwall near center under Granite Slab #5, area of voids due to missing stones with cracked stones above.



Photo 28: Breastwall - North breastwall at east end, void at drain pipe due to missing stones and deteriorated mortar. Note drain pipe is fractured.

REPORT H

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 21

2-DIST
04B.I.N.
7XF

STRUCTURES INSPECTION FIELD REPORT

SPECIAL MEMBER INSPECTION

BR. DEPT. NO.
A-10-015

CITY/TOWN ARLINGTON	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	11-KILO. POINT 000.000	90-ROUTINE INSP. DATE Jan 26, 2021	93*-SPEC. MEMB. INSP. DATE Jan 27, 2022
07-FACILITY CARRIED US 3 MYSTIC ST	MEMORIAL NAME/LOCAL NAME	27-YR BUILT 1850	106-YR REBUILT 1958	*YR REHAB'D (NON 106) 0000
06-FEATURES INTERSECTED WATER MILL BROOK	26-FUNCTIONAL CLASS Urban Arterial	DIST. BRIDGE INSPECTION ENGINEER J. Dideo <i>Susan Dideo</i>		
43-STRUCTURE TYPE 801 : Masonry Slab	22-OWNER Town Agency	21-MAINTAINER Town Agency	TEAM LEADER J. Rosatone, P.E. <i>J. Rosatone</i> MA PE # #41573	PROJ MGR Dewberry <i>J. D. Dideo</i> MA PE # 35559
107-DECK TYPE 9 : Other	WEATHER Clear	TEMP. (air) -4°C	TEAM MEMBERS R. CLEMENTE	

WEIGHT POSTING	<i>Not Applicable</i>				X	At bridge	Advance	PLANS (Y/N): Y
Actual Posting	N	N	N	N	Signs In Place (Y=Yes, N=No, NR=Not Required)	N S	N S	(V.C.R.) (Y/N): N
Recommended Posting	N	N	N	N	Legibility/ Visibility			TAPE#:
Waived Date:	00/00/0000		EJDMT Date:	00/00/0000				
RATING Rating Report (Y/N): N Date: ----- Recommend for Rating or Rerating (Y/N): N If YES please give priority: HIGH () MEDIUM () LOW ()								
Inspection data at time of existing rating I 58: - I 59: - I 60: - I 62: - Date: 00/00/0000								

SPECIAL MEMBER(S):

	MEMBER	CRACK (Y/N):	WELD'S CONDITION (0-9)	LOCATION OF CORROSION, SECTION LOSS (%), CRACKS, COLLISION DAMAGE, STRESS CONCENTRATION, ETC.	CONDITION		INV. RATING OF MEMBER FROM RATING ANALYSIS	Deficiencies
					PREVIOUS (0-9)	PRESENT (0-9)		
A	Item 58.2 - Deck Condition	N	N	See remarks in comments section.	3	3	Not Rated	S-A
B	Item 59.4 - Girders or Beams	N	N	See remarks in comments section.	3	3	Not Rated	S-A
C	Item 60.1.d - Breastwalls	N	N	See remarks in comments section.	4	4	Not Rated	S-A
D								
E								

List of field tests performed:

I-58 I-59 I-60 I-62

(Overall Previous Condition)

3 3 4 -

(Overall Current Condition)

3 3 4 -

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion of steel, Minor scouring, Clogged drainage, etc.

S= Severe/Major Deficiency Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroded rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.

C-S= Critical Structural Deficiency A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

C-H= Critical Hazard Deficiency A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.

URGENCY OF REPAIR:

I= Immediate-

[Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the Deficiency and to receive further instruction from him/her].

A= ASAP-

[Action/Repair should be initiated by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) upon receipt of the Inspection Report].

P= Prioritize-

[Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

X=UNKNOWN

N=NOT APPLICABLE

H=HIDDEN/INACCESSIBLE

R=REMOVED

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 27, 2022
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REMARKS**BRIDGE ORIENTATION**

Bridge A-10-015 (7XF) carries Mystic Street (US 3) over Mill Brook in the Town of Arlington. Traffic on Mill Street travels in the north/south directions. Mill Brook flows from west to east. Bridge elevations are labeled west and east. Approaches and abutment are labeled north and south. The spans are numbered 1 and 2 from south to north. The granite slabs, reinforced concrete slab/encasement sections and steel I-beams are numbered from west to east within each span.

GENERAL REMARKS

The bridge has two spans with a superstructure consisting of reinforced concrete slabs/encasements, granite slabs and steel I-beams. The granite slabs are from the original construction (estimated 1850) and the reinforced concrete slabs are from the widening project in 1958. The steel I-beams were added later at an unknown date.

The substructure consists of stone masonry abutments and pier. The west and east sidewalks extend beyond the limits of the original masonry abutments and are supported by separate concrete abutments and piers.

For a location map, **see Sketch 1**. For a plan view, **see Sketch 2**. For elevations, **see Sketch 3**. For framing plan deficiencies see **Sketches 4 and 5**. For substructure deficiencies see **Sketch 6**. For a general view of the bridge, **see Photo 1**.

ACCESS REMARKS

The bridge was inspected between 9am and 1pm with the use of chest waders.

ITEM 58 - DECK**Item 58.2 - Deck Condition**

Deficiencies to the underside of the reinforced concrete slabs/encasements are noted under this item. There are reinforced concrete slabs in both spans at the east and west ends of the bridge, four in Span 1 and two in Span 2. The concrete deck underside has areas of delamination, some with separation cracks, spalls with exposed corroded reinforcing, areas of moderate to heavy scaling with map cracking, rust staining and efflorescence, and some isolated areas of timer formwork left behind. The underside of the west sidewalk has several spalls with exposed corroded reinforcing, moderate to heavy scaling and some honeycombing (**see Photo 2**).

The most significant deficiencies are as follows:

- **(S/A Deficiency) Span 1, Concrete Slab/Encasement No. 3 at South Abutment** - 3ft long x 18in wide x 11in deep spall/void at the interface with the granite slab. The granite curb stones from the original construction are clearly visible (see Photo 3 and Note 8 on Sketch 4).
- **(S/A Deficiency) Span 1, Concrete Slab/Encasement No. 3 at pier** - 16in long x 8in wide x 8in deep spall/void at the interface with the granite slab (see Note 9 on Sketch 4).
- **(S/A Deficiency) Span 2, Concrete Slab/Encasement No. 2 at North Abutment** - Underside of deck slab has an 18in x 20in x 3in deep spall exposing (4) transverse bars with up to 50% section loss and an adjacent 2ft-8in long x 20in wide incipient spall with a 5/8in separation crack (see Photo 4 and Note 21 on Sketch 5).

For a complete list of Item 58.2 - Deck Condition deficiencies, **see Sketches 4 and 5**.

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REMARKS**ITEM 59 - SUPERSTRUCTURE****Item 59.4 - Girders or Beams**

Deficiencies to the steel I-beams, granite slabs and concrete sidewalk beams and fascia beams are noted under this item. Span 1 consists of ten (10) granite slabs and four (4) closely bunched steel I-beams. Span 2 consists of eleven (11) granite slabs and fourteen (14) closely bunched steel I-beams. The steel beams have a 5-1/2in wide bottom flange and are placed abutting each other so only the bottom face of the bottom flange is visible. Red masonry brick can be seen above the steel beams at some locations.

There are two (2) longitudinal reinforced concrete beams supporting each sidewalk (one (1) fascia beam and one (1) sidewalk beam) and one transverse beam supported by a column near mid-span. The spaces between the sidewalk and fascia beams each comprise a utility bay.

The most significant deficiencies are as follows:

Concrete Beams:

- **(S/A Deficiency) West Fascia Beam - Widespread heavy spalling along the bottom and west faces of the beam, up to full height with exposed heavily corroded rebar with section loss, worst in Span 2. East face has moderate to heavy scaling with map cracking up to full height in both spans (see Photos 5 and 6, Notes 1 and 1a on Sketch 4 and Notes 11 and 11a on Sketch 5).**
- **(S/A Deficiency) West Sidewalk Beam - Widespread heavy spalling along the bottom face of the beam with exposed heavily corroded rebar with up to 50% section loss, worst in Span 1 (see Photo 7, Note 3 on Sketch 4 and Note 13 on Sketch 5).**

For additional deficiencies on the Concrete Beams, see Notes 22 and 23 on **Sketch 5** and **Photos 8, 9 and 10**.

Steel Beams:

The steel I-beams typically exhibit minor to moderate corrosion to the bottom flange, except as follows:

- **Span 1, Steel Beam No. 1 - Heavy corrosion with multiple rust laminations and efflorescence to the bottom flange for full beam length. At mid-span, remaining flange thickness is 1/16in (west side) to 3/16in (east side) x 4.375in wide (see Photo 11 and Note 6 on Sketch 4).**
- **Span 1, Steel Beam No. 4 - Heavy corrosion to the bottom flange with isolated areas of up to 100% section loss along the edges (see Photo 12 and Note 6a on Sketch 4).**

Granite Slabs:

Active leakage at the interfaces between the granite slabs was reported in the previous report. Icy surfaces and icicles in several locations indicate that leakage is ongoing.

Span 1:

- **(S/A Deficiency) Granite Slab No. 9 - 3ft long longitudinal hairline crack at the south abutment (see Note 7a on Sketch 4).**
- **(S/A Deficiency) Granite Slab No. 10 - Full width transverse hairline crack at mid-span (see Note 7 on Sketch 4).**

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REMARKS

Span 2:

- **(S/A Deficiency)** Granite Slab No. 1 - 3ft long longitudinal hairline crack at the north abutment and 12in long longitudinal hairline crack near the pier (see Notes 15-16 on Sketch 5).
- **(S/A Deficiency)** Granite Slab No. 6 - Full width x 5/16in wide transverse crack at mid-span extending up to full height on both vertical faces (see Photo 13 and Note 17 on Sketch 5).
- **(S/A Deficiency)** Granite Slab No. 8 - Full width x 1/8in wide transverse crack at mid-span (see Photo 14 and Note 18 on Sketch 5).
- **(S/A Deficiency)** Granite Slab No. 10 - 4in long x 2in wide x 5in high piece of the granite slab is split at the northwest corner (see Photo 15 and Note 19 on Sketch 5).

Transverse Sidewalk Beams:

- West Transverse Beam, North Face - 4ft long x 6in high x 8in wide (on bottom face) edge spall with exposed rebar with adjacent 3ft-6in long x 6in high delamination in process of spalling (see Photo 16).
- West Transverse Beam, South Face - 3ft-6in long x 12in high x 4in deep spall with surrounding delamination up to 10in high (see Photo 17).

For a complete list of Item 59.4 - Girders or Beams deficiencies, see **Sketches 4 and 5**. For an additional photo of deficiencies, see **Photo 18**.

ITEM 60 - SUBSTRUCTURE**Item 60.1 - Abutments****Item 60.1.d - Breastwalls**

The breastwalls have several scattered voids due to missing chinking stones, typically surrounding drainpipe outfalls. A void noted at the west corner of the South Breastwall in the July 2020 Special Member report was hidden from view during inspection due to high water level.

The most significant deficiencies are as follows:

North Breastwall:

- **(S/A Deficiency)** West end - 5ft-6in wide x 7.5in high x 2ft deep void due to missing stones (see Photo 19 and Note D on Sketch 6).
- **(S/A Deficiency)** East end - 3ft wide x 2ft-6in high x up to 21in deep void due to missing stones around utility pipe (see Photo 20 and Note H on Sketch 6).

For a complete list of Item 60.1.d - Breastwalls deficiencies, see **Sketch 6**.

Sketch / Photo Log

- Sketch 1 : Location Map
 Sketch 2 : Plan View
 Sketch 3 : East and West Elevations
 Sketch 4 : Underside Deficiencies - 1 of 2 (Span 1)
 Sketch 5 : Underside Deficiencies - 2 of 2 (Span 2)
 Sketch 6 : Breastwall Deficiencies
 Photo 1 : West elevation.
 Photo 2 : Span 1, Between West Fascia and Sidewalk Beam - Spall with exposed transverse and longitudinal bars on underside of deck slab.

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REMARKS				
Photo 3 :	Span 1, Concrete Slab/Encasement No. 3 - Spall/void at interface with granite slab, with original curb stones visible.			
Photo 4 :	Span 2, Concrete Slab/Encasement No. 2 - Large spall with heavily corroded reinforcing steel and adjacent incipient spall.			
Photo 5 :	Span 2, West Fascia Beam, West Face - Extensive spalling with exposed heavily corroded stirrups with up to 75% section loss.			
Photo 6 :	Span 2, West Fascia Beam, East Face - Moderate to heavy scaling with map cracking up to full height.			
Photo 7 :	Span 1, West Sidewalk Beam - Extensive spalling to bottom face with exposed heavily corroded reinforcing with up to 50% section loss.			
Photo 8 :	Span 1, East Sidewalk Beam, East Face - 1/2in wide longitudinal separation crack along bottom edge with some delam. areas below.			
Photo 9 :	Span 1, East Fascia Beam, Bottom Face - Hollow area surrounding a full length crack and rust spots.			
Photo 10 :	Span 1, East Fascia Beam, West Face - 1/2in wide longitudinal separation crack with areas of moderate scaling below.			
Photo 11 :	Span 1, Steel I-beam No. 1 - Heavily corroded bottom flange has 1/16in remaining thickness at mid-span.			
Photo 12 :	Span 1, Steel I-beam No. 4 - Heavy corrosion to bottom flange with up to 100% section loss along the edges.			
Photo 13 :	Span 2, Granite Slab No. 6 - Full width x 5/16in wide transverse crack at mid-span extending up to full height on both vertical faces.			
Photo 14 :	Span 2, Granite Slab No. 8 - Full width x 1/8in wide transverse crack at mid-span.			
Photo 15 :	Span 2, Granite Slab No. 10 - 4in long x 2in wide x 5in high split section at northwest corner.			
Photo 16 :	West Transverse Sidewalk Beam, North Face - Edge spall with exposed rebar and adjacent delamination in process of spalling.			
Photo 17 :	West Transverse Sidewalk Beam, South Face - 4in deep spall with surrounding delamination up to 10in high.			
Photo 18 :	Span 1, West Fascia Beam - Longitudinal hairline cracks with efflo., small areas of surrounding delam. and scaling at mid-span.			
Photo 19 :	North Breastwall Near West End - 5ft-6in wide x 7.5in high x up to 2ft deep void due to missing stones undermining stone above.			
Photo 20 :	North Breastwall Near East End - 3ft wide x 2ft-6in high x up to 21in deep void due to missing stones around drain pipe.			

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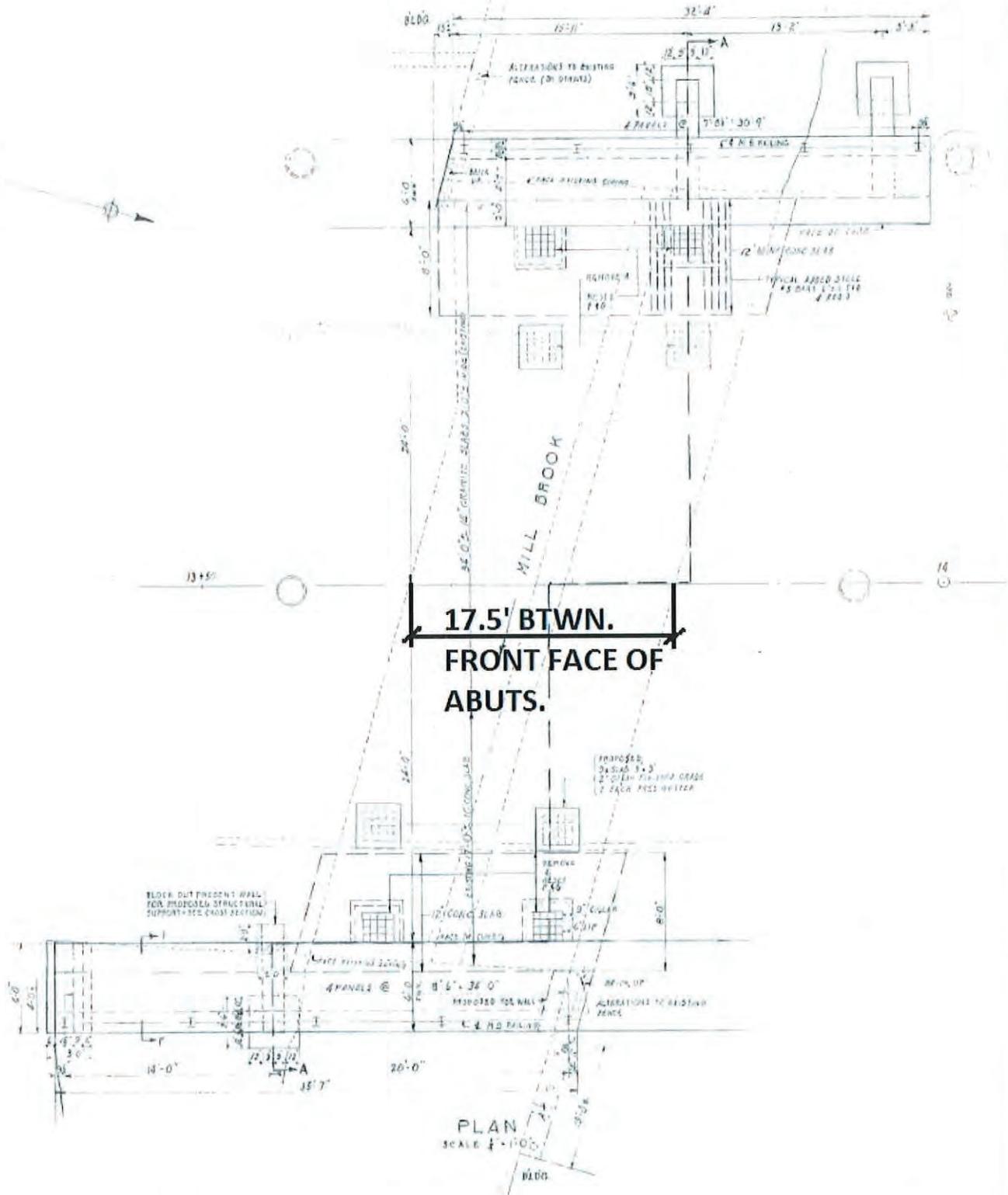
A10015-7XF-MUN-BRI

INSPECTION DATE
JAN 27, 2022**SKETCHES**

Sketch 1: Location Map

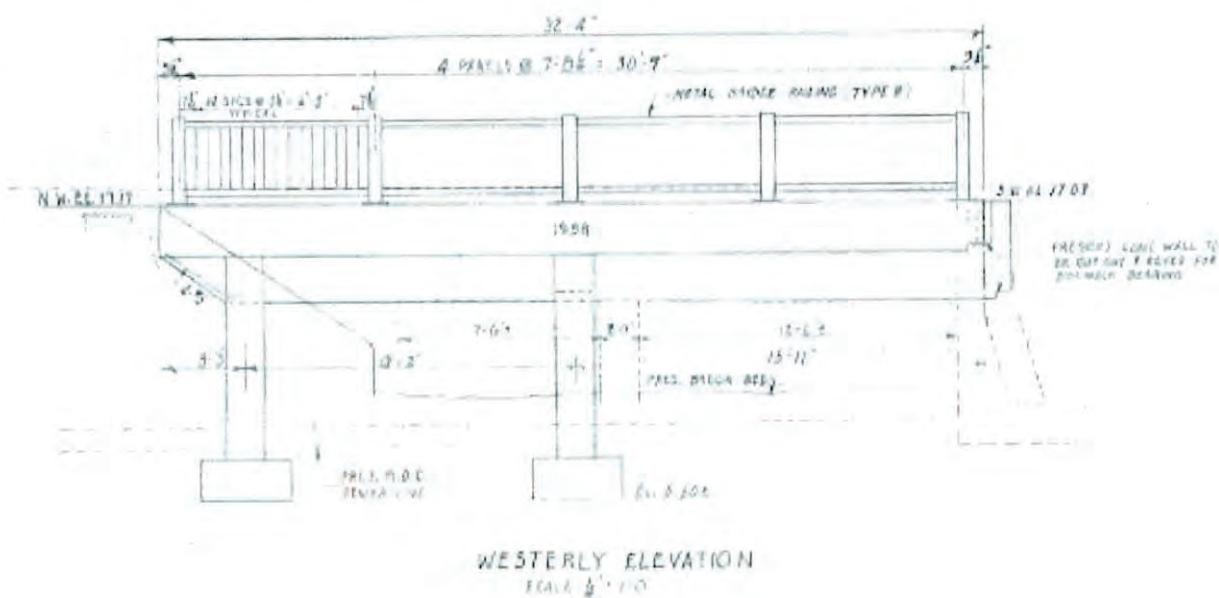
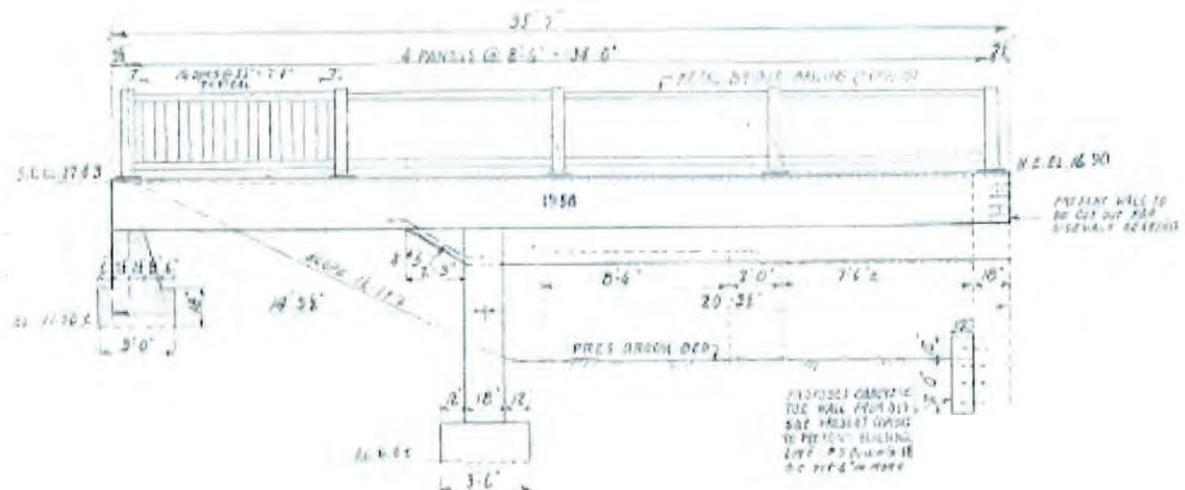
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SKETCHES



Sketch 2: Plan View

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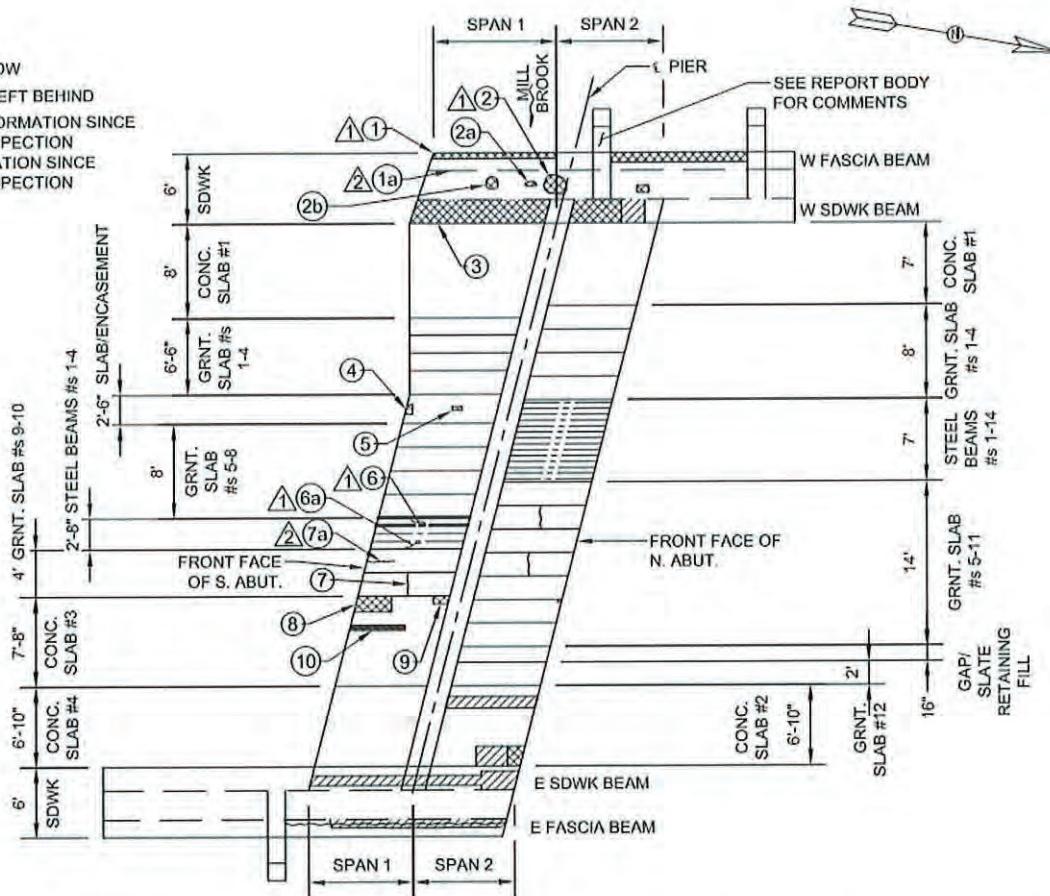
SKETCHES**Sketch 3: East and West Elevations**

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SKETCHES

LEGEND

- [Cross-hatch] SPALL
- [Hatched] DELAM./HOLLOW
- [Solid dark gray] FORMWORK LEFT BEHIND
- [Solid light gray triangle] UPDATED INFORMATION SINCE PREVIOUS INSPECTION
- [Open triangle] NEW INFORMATION SINCE PREVIOUS INSPECTION



SPAN 1

1. FL OF SPAN x 12in H x 6in D SPALL WITH EXPOSED REBAR WITH UP TO 75% SECTION LOSS ALONG TOP EDGE OF W FASCIA. BOTTOM FACE OF BEAM HAS SEVERAL LONGITUDINAL HAIRLINE CRACKS THROUGHOUT BOTH SPANS W/ HEAVY EFFLO., SMALL AREAS OF SURROUNDING DELAM. AND A 2ft L x UP TO FW x UP TO 2in D AREA OF SCALING AT MIDSPAN. 3ft-6in L x 2in W x 2in H SPALL ALONG BOTTOM WEST EDGE
- 2a. E FACE, MIDSPAN TO S ABUT. - MODERATE SCALING W/ MAP CRACKING AND HEAVY SCALING AT MIDSPAN UP TO 2in DEEP
2. UNDERSIDE OF DECK SLAB - 2ft L x 22in W x 1.5in D SPALL W/ (4) TRANSVERSE BARS AND (1) LONGITUDINAL BAR EXPOSED
- 2a. UNDERSIDE OF DECK SLAB - 5in L x 12in W x 1.5in D SPALL W/ (1) TRANSVERSE BAR EXPOSED
- 2b. UNDERSIDE OF DECK SLAB - 12in L x 12in W x 1.5in D SPALL W/ (2) TRANSVERSE BARS EXPOSED
3. BOTTOM FACE OF SIDEWALK BEAM - FL OF SPAN x FW x 3in D SPALL CONTAINING EXPOSED TRANSVERSE AND LONGITUDINAL BARS W/ SECTION LOSS UP TO 50% AND (1) BROKEN TRANSVERSE BAR NEAR MIDSPAN

4. ENCASEMENT AT S ABUT. - 7in L x 10in W x UP TO 1.5in D SPALL EXPOSING BOTTOM FLANGE OF BEAMS ABOVE
5. 10in L x 4in W x 1.5in D SPALL W/ EXPOSED BOTTOM FLANGE OF BEAM ABOVE
6. STEEL BEAM BOTTOM FLANGE AT MIDSPAN - REMAINING THICKNESS VARIES FROM 1/16in (W SIDE) TO 3/16in (E SIDE) x 4.375in W
- 6a. STEEL BEAM BOTTOM FLANGE - HEAVY CORROSION W/ EFFLORESCENCE AND SECTION LOSS ALONG THE EDGES
7. GRANITE SLAB AT MIDSPAN - FW TRANSVERSE HAIRLINE CRACK
- 7a. GRANITE SLAB AT S ABUT. - 3ft L LONGITUDINAL HAIRLINE CRACK
8. 3ft L x 18in W x 11in D SPALL/VOID AT INTERFACE W/ GRANITE SLAB; GRANITE CURB STONES FROM ORIGINAL CONSTRUCTION ARE VISIBLE
9. 16in L x 8in W x 8in D SPALL/VOID AT INTERFACE W/ GRANITE SLAB
10. 4ft-8in L x 5in W TIMBER FORMWORK LEFT BEHIND

Sketch 4: Underside Deficiencies - 1 of 2 (Span 1)

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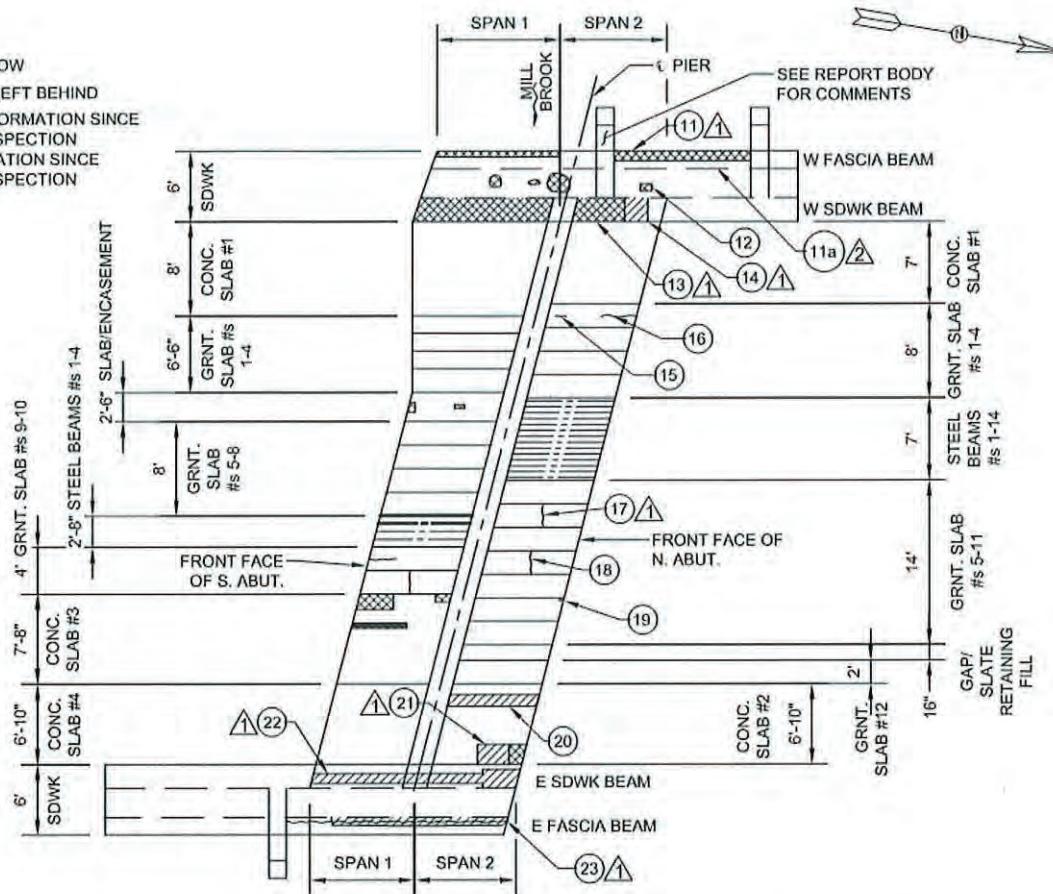
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INSPECTION DATE
JAN 27, 2022

SKETCHES

LEGEND

- [diagonal lines] SPALL
- [diagonal lines with dots] DELAM./HOLLOW
- [solid black box] FORMWORK LEFT BEHIND
- [triangle with exclamation mark] UPDATED INFORMATION SINCE PREVIOUS INSPECTION
- [triangle with exclamation mark and circle] NEW INFORMATION SINCE PREVIOUS INSPECTION

SPAN 2

11. W FACE - FL OF SPAN 1 UP TO FH X UP TO 16in D (AT TOP) AND 10in D (AT BOTTOM) SPALL WITH HEAVY RUSTING TO THE EXPOSED LONGITUDINAL REINFORCING AND UP TO 75% SECTION LOSS TO STIRRUPS; SPALL EXTENDS UP TO 16in W ON TOP FACE. BOTTOM FACE - 3ft-10in L x 12in W x 3.5in D SPALL
- 11a. E FACE - 8ft LONG X UP TO FH MODERATE TO HEAVY SCALING WITH HEAVY MAP CRACKING, EXTENDING UP TO 3in WIDE ON BOTTOM FACE
12. UNDERSIDE OF DECK SLAB - 18in L x 7in W X UP TO 1in D HEAVY SCALING W/ EXPOSED REINFORCING
13. BOTTOM FACE OF SDWK BEAM - 5ft-6in L x FW x 4.5in D SPALL W/ EXPOSED HEAVILY CORRODED REINFORCING W/ APPROX. 25% SECTION LOSS AND ADJACENT 2ft L x FW DELAM. W FACE - 4ft L x 1/8in W HORIZONTAL CRACK W/ RUST STAINING.
14. 18in L AREA OF RUST STAINING AT JOINT BETWEEN SDWK BEAM AND CONCRETE SLAB/ENCASEMENT; NO ACTIVE LEAKAGE
15. 12in L LONGITUDINAL HAIRLINE CRACK IN GRANITE SLAB
16. 3ft L LONGITUDINAL HAIRLINE CRACK IN GRANITE SLAB
17. GRANITE SLAB AT MIDSPAN - FW x 5/16in W TRANSVERSE CRACK EXTENDING UP TO FULL VISIBLE HEIGHT ON BOTH VERTICAL FACES.
18. GRANITE SLAB AT MIDSPAN - FW x 1/8in W TRANSVERSE CRACK
19. NORTHWEST CORNER OF GRANITE SLAB - 4in L x 2in W x 5in H SPLIT SECTION
20. FL x 12in W AREA CONTAINING LONGITUDINAL HAIRLINE CRACKS W/ EFFLO., RUST STAINING AND SMALL AREAS OF SURROUNDING DELAM.
21. UNDERSIDE OF DECK SLAB - 18in L x 20in W x 3in D SPALL EXPOSING (4) TRANSVERSE BARS W/ UP TO 50% SECTION LOSS AND A 2ft-8in L x 20in W INSIPIENT SPALL W/ WITH A 5/8in W SEPARATION CRACK.
22. BOTTOM FACE - FL OF BOTH SPANS X UP TO 19in W DELAM. W/ RUST STAINING ADJACENT TO HAIRLINE LONGITUDINAL CRACK. E FACE - FL OF BOTH SPANS X UP TO 1/2in W LONGITUDINAL SEPARATION CRACK ALONG BOTTOM EDGE W/ RUST STAINING AND SECTIONS OF DELAM. BELOW
23. BOTTOM FACE OF FASCIA BEAM - 10.5ft L x 9in W HOLLOW AREA W/ RUST SPOTS, SURROUNDING A FULL LENGTH x 1/16in W CRACK. W FACE - 1/2in WIDE X FL SEPARATION CRACK APPROX. 6in FROM BOTTOM FACE W/ AREAS OF HEAVY SCALING BELOW THE CRACK

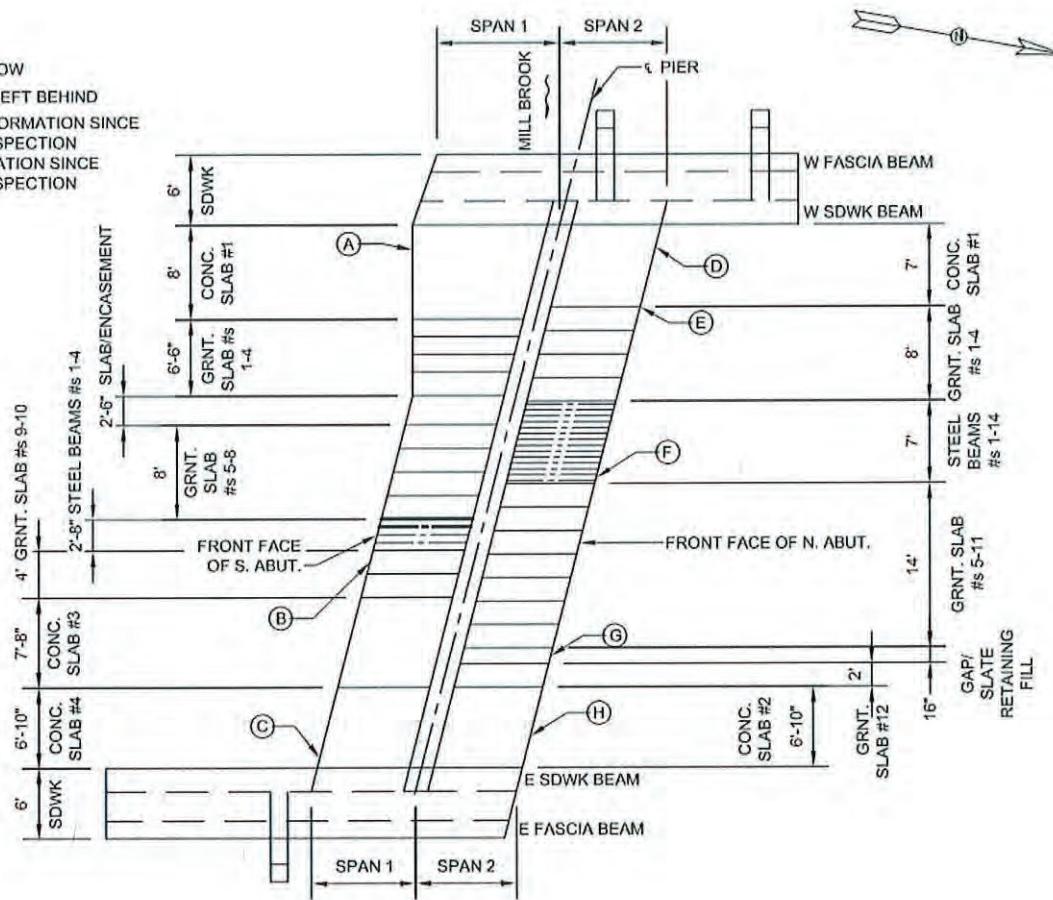
Sketch 5: Underside Deficiencies - 2 of 2 (Span 2)

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SKETCHES

LEGEND

- [diagonal lines] SPALL
- [cross-hatch] DELAM./HOLLOW
- [solid black] FORMWORK LEFT BEHIND
- [triangle] UPDATED INFORMATION SINCE PREVIOUS INSPECTION
- [triangle] NEW INFORMATION SINCE PREVIOUS INSPECTION

SOUTH BREASTWALL

- A. 18in W x 10in H x UP TO 16in D VOID DIRECTLY BELOW PIPE
- B. 27in W x 7in H x UP TO 21in D VOID UNDERMINING STONE
- C. LOOSE STONES AND DETERIORATED MASONRY AND MORTAR

NORTH BREASTWALL

- D. 5ft-6in W x 7.5in H x UP TO 2ft D VOID DUE TO MISSING STONES UNDERMINING THE STONE ABOVE
- E. 2ft-6in W x UP TO 6in H x UP TO 18in D VOID DUE TO MISSING CHINKING STONES W/ ADJACENT 8in W x UP TO 12in H x UP TO 12in D VOID
- F. 2ft-6in W x 6in H x UP TO 14in D AREA OF VOIDS DUE TO MISSING STONES ABOVE
- G. 18in W x UP TO 18in H x UP TO 20in D VOID UNDERMINING STONE
- H. 3ft W x 2ft-6in H x UP TO 21in D VOID DUE TO MISSING STONES AROUND DRAIN PIPE

Sketch 6: Breastwall Deficiencies

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PHOTOS

Photo 1: West elevation.



Photo 2: Span 1, Between West Fascia and Sidewalk Beam - Spall with exposed transverse and longitudinal bars on underside of deck slab.

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PHOTOS

Photo 3: Span 1, Concrete Slab/Encasement No. 3 - Spall/void at interface with granite slab, with original curb stones visible.



Photo 4: Span 2, Concrete Slab/Encasement No. 2 - Large spall with heavily corroded reinforcing steel and adjacent incipient spall.

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PHOTOS

Photo 5: Span 2, West Fascia Beam, West Face - Extensive spalling with exposed heavily corroded stirrups with up to 75% section loss.



Photo 6: Span 2, West Fascia Beam, East Face - Moderate to heavy scaling with map cracking up to full height.

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PHOTOS



Photo 7: Span 1, West Sidewalk Beam - Extensive spalling to bottom face with exposed heavily corroded reinforcing with up to 50% section loss.



Photo 8: Span 1, East Sidewalk Beam, East Face - 1/2in wide longitudinal separation crack along bottom edge with some delam. areas below.

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PHOTOS

Photo 9: Span 1, East Fascia Beam, Bottom Face - Hollow area surrounding a full length crack and rust spots.



Photo 10: Span 1, East Fascia Beam, West Face - 1/2in wide longitudinal separation crack with areas of moderate scaling below.

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PHOTOS

Photo 11: Span 1, Steel I-beam No. 1 - Heavily corroded bottom flange has 1/16in remaining thickness at mid-span.



Photo 12: Span 1, Steel I-beam No. 4 - Heavy corrosion to bottom flange with up to 100% section loss along the edges.

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PHOTOS



Photo 13: Span 2, Granite Slab No. 6 - Full width x 5/16in wide transverse crack at mid-span extending up to full height on both vertical faces.



Photo 14: Span 2, Granite Slab No. 8 - Full width x 1/8in wide transverse crack at mid-span.

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PHOTOS



Photo 15: Span 2, Granite Slab No. 10 - 4in long x 2in wide x 5in high split section at northwest corner.



Photo 16: West Transverse Sidewalk Beam, North Face - Edge spall with exposed rebar and adjacent delamination in process of spalling.

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PHOTOS

Photo 17: West Transverse Sidewalk Beam, South Face - 4in deep spall with surrounding delamination up to 10in high.



Photo 18: Span 1, West Fascia Beam - Longitudinal hairline cracks with efflo., small areas of surrounding delam. and scaling at mid-span.

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PHOTOS



Photo 19: North Breastwall Near West End - 5ft-6in wide x 7.5in high x up to 2ft deep void due to missing stones undermining stone above.



Photo 20: North Breastwall Near East End - 3ft wide x 2ft-6in high x up to 21in deep void due to missing stones around drain pipe.

REPORT G

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 19

2-DIST

B.I.N.

04

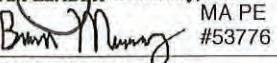
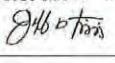
7XF

STRUCTURES INSPECTION FIELD REPORT

SPECIAL MEMBER INSPECTION

BR. DEPT. NO.

A-10-015

CITY/TOWN ARLINGTON	8-STRUCTURE NO. A10015-7XF-MUN-BRI	11-KILO. POINT 000.000	90-ROUTINE INSP. DATE Jan 26, 2021	93*-SPEC. MEMB. INSP. DATE Jul 29, 2021
07-FACILITY CARRIED US 3 MYSTIC ST	MEMORIAL NAME/LOCAL NAME	27-YR BUILT 1850	106-YR REBUILT 1958	*YR REHAB'D (NON 106) 0000
06-FEATURES INTERSECTED WATER MILL BROOK	26-FUNCTIONAL CLASS Urban Arterial	DIST. BRIDGE INSPECTION ENGINEER J. Dideo 		
43-STRUCTURE TYPE 801 : Masonry Slab	22-OWNER Town Agency	21-MAINTAINER Town Agency	TEAM LEADER B. Murray, P.E.  B. Murray #53776	PROJ MGR Dewberry  J. H. Dewberry MA PE # 35559
107-DECK TYPE 9 : Other	WEATHER Clear	TEMP. (air) 24°C	TEAM MEMBERS R. CLEMENTE	
WEIGHT POSTING Not Applicable	X	At bridge	Advance	PLANS (Y/N): Y
Actual Posting	N N N N	Signs In Place (Y=Yes, N=No, NR=Not Required)	N S	(V.C.R.) (Y/N): N
Recommended Posting	N N N N	Legibility/Visibility	N S	TAPE#: _____
Waived Date: 00/00/0000	EJDMT Date: 00/00/0000			

RATING

Rating Report (Y/N): **N**Date: **----**Recommend for Rating or Rerating (Y/N): **N**

If YES please give priority:

HIGH () MEDIUM () LOW ()

REASON:

Inspection data at time of existing rating
158: - 159: - 160: - 162: - Date: 00/00/0000

SPECIAL MEMBER(S):

	MEMBER	CRACK (Y/N):	WELD'S CONDITION (0-9)	LOCATION OF CORROSION, SECTION LOSS (%), CRACKS, COLLISION DAMAGE, STRESS CONCENTRATION, ETC.	CONDITION		INV. RATING OF MEMBER FROM RATING ANALYSIS	Deficiencies
					PREVIOUS (0-9)	PRESENT (0-9)		
A	Item 58.2 - Deck Condition	N		See remarks in comments section.	3	3	Not Rated	S-A
B	Item 59.4 - Girders or Beams	N		See remarks in comments section.	3	3	Not Rated	S-A
C	Item 60.1.d - Breastwalls	N		See remarks in comments section.	4	4	Not Rated	S-A
D								
E								

List of field tests performed:

I-58 I-59 I-60 I-62

(Overall Previous Condition)

3 3 4 -

(Overall Current Condition)

3 3 4 -

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion of steel, Minor scouring, Clogged drainage, etc.

S= Severe/Major Deficiency - Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroded rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.

C-S= Critical Structural Deficiency - A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

C-H= Critical Hazard Deficiency - A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.

URGENCY OF REPAIR:

I = Immediate- [Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the Deficiency and to receive further instruction from him/her].

A = ASAP- [Action/Repair should be initiated by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) upon receipt of the Inspection Report].

P = Prioritize- [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

X=UNKNOWN

N=NOT APPLICABLE

H=HIDDEN/INACCESSIBLE

R=REMOVED

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 29, 2021
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REMARKS

BRIDGE ORIENTATION

Bridge A-10-015 (7XF) carries Mystic Street (US 3) over Mill Brook in the Town of Arlington. Traffic on Mill Street travels in the north/south directions. Mill Brook flows from west to east. Bridge elevations are labeled west and east. Approaches and abutment are labeled north and south. The spans are numbered 1 and 2 from south to north. The granite slabs, concrete slab/encasement sections and steel I-beams are numbered from west to east within each span.

GENERAL REMARKS

The bridge has two spans with a superstructure consisting of reinforced concrete slabs/encasements, granite slabs and steel I-beams. The granite slabs are from the original construction (estimated 1850) and the reinforced concrete slabs are from the widening project in 1958. The steel I-beams were added later at an unknown date.

The substructure consists of stone masonry abutments and pier. The west and east sidewalks extend beyond the limits of the original masonry abutments and are supported by separate concrete abutments and piers.

For a location map, **see Sketch 1**. For a plan view, **see Sketch 2**. For elevations, **see Sketch 3**. For general views of the bridge, **see Photos 1-2**.

ACCESS REMARKS

The bridge was inspected between 9am and 1pm with the use of chest waders.

ITEM 58 - DECK

Item 58.2 - Deck Condition

Deficiencies to the underside of the reinforced concrete slabs/encasements are noted under this item. For deficiencies to the concrete sidewalk and fascia beams, steel I-beams and granite slabs, see Item 59.4 - Girders or Beams. There are four (4) concrete slabs/encasements in Span 1 and two (2) in Span 2. The concrete deck underside has areas of delamination, spalls with exposed corroded rebar, cracking with rust staining and efflorescence, and an isolated areas of timber formwork left behind. The underside of the west sidewalk has several spalls with exposed corroded rebar, moderate scaling and some honeycombing.

The most significant deficiencies are as follows:

- **(S/A Deficiency) Span 1, Concrete Slab No. 3 at South Abutment - 3ft long x 18in wide x 11in deep spall/void at the interface with the granite slab. The granite curb stones from the original construction are clearly visible (see Photo 3 and Note 8 on Sketch 4).**
- **(S/A Deficiency) Span 1, Concrete Slab No. 3 at pier - 16in long x 8in wide x 8in deep spall/void at the interface with the granite slab (see Note 9 on Sketch 4).**

For a complete list of Item 58.2 - Deck Condition deficiencies, **see Sketch 4**. For an additional photo of deficiencies, **see Photo 4**.

ITEM 59 - SUPERSTRUCTURE

Item 59.4 - Girders or Beams

Item 59.4 - Girders or Beams

Deficiencies to the steel I-beams, granite slabs and concrete sidewalk beams and fascia beams are noted under this item. Span 1 consists of ten (10) granite slabs and four (4) closely bunched steel I-beams. Span 2 consists of eleven (11) granite slabs and fourteen (14) closely bunched steel I-beams. The steel beams

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REMARKS

Item 59.4 - Girders or Beams (Cont'd)

have a 5-1/2in wide bottom flange and are placed abutting each other so only the bottom face of the bottom flange is visible. Red masonry brick can be seen above the steel beams. There are two (2) longitudinal concrete beams supporting each sidewalk (one (1) fascia beam and one (1) sidewalk beam) and one transverse beam supported by a column near midspan. The spaces between the sidewalk and fascia beams each comprise a utility bay. The most significant deficiencies are listed below.

Concrete Beams:

- **(S/A Deficiency) West Fascia Beam - Widespread heavy spalling along the bottom and west faces of the beam, up to full height with exposed and heavily corroded rebar with section loss, worst in Span 2 (see Photo 5 and Notes 1 and 11 on Sketch 4).**
- **(S/A Deficiency) West Sidewalk Beam - Widespread heavy spalling along the bottom face of the beam with exposed and heavily corroded rebar with section loss, worst in Span 1 (see Photo 6 and Notes 3 and 13 on Sketch 4).**
- For additional deficiencies on the Concrete Beams, see Notes 22 and 23 on **Sketch 4** and **Photos 7 and 8**.

Steel Beams:

- 90% of the steel I-beams exhibit minor to moderate corrosion to the bottom flange and 10% exhibit heavy surface corrosion.
- **Span 1, Steel Beam No. 1 - Laminar rust to the bottom flange with isolated areas of up to 100% section loss along the edges (see Photo 9 and Note 6 on Sketch 4).**

Granite Slabs:

There is typically active leakage at the interfaces between the granite slabs.

Span 1:

- **(S/A Deficiency) Granite Slab No. 10 - Full-width transverse hairline crack at midspan (see Note 7 on Sketch 4).**

Span 2:

- **(S/A Deficiency) Granite Slab No. 1 - 3ft long longitudinal hairline crack at the north abutment and 12in long longitudinal hairline crack near the pier (see Notes 15-16 on Sketch 4).**
- **(S/A Deficiency) Granite Slab No. 6 - Full width x 1/2in wide transverse crack at midspan extending up to full visible height on both vertical faces (see Photo 10 and Note 17 on Sketch 4).**
- **(S/A Deficiency) Granite Slab No. 8 - Full width x 1/8in wide transverse crack at midspan (see Photo 11 and Note 18 on Sketch 4).**
- **(S/A Deficiency) Granite Slab No. 10 - 4in long x 2in wide x 5in high piece of the granite slab is split at the northwest corner (see Photo 12 and Note 19 on Sketch 4).**

Transverse Sidewalk Beams:

- West Transverse Beam, North Face - 27in long x 6in high x 6in wide on bottom face x up to 2.5in deep edge spall with exposed rebar with adjacent 3ft-6in long x 6in high delamination in process of spalling (see Photo 13).
- West Transverse Beam, South Face - 3ft-6in long x 11in high x 2.5in deep spall with surrounding delamination up to 10in high (see Photo 14).

For a complete list of Item 59.4 - Girders or Beams deficiencies, **see Sketch 4**. For an additional photo of deficiencies, **see Photo 15**.

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REMARKS**ITEM 60 - SUBSTRUCTURE****Item 60.1 - Abutments****Item 60.1.d - Breastwalls**

The breastwalls have several scattered voids due to missing chinking stones, especially surrounding drainpipe outfalls. An 18in wide x 10in high x 16in deep void noted at the west corner of the South Breastwall in the previous Special Member report, dated July 2020, was hidden from view during inspection due to high water level.

The most significant deficiencies are listed below.

North Breastwall:

- **(S/A Deficiency) West end - 5ft-6in wide x 7.5in high x 2ft deep void due to missing stones undermining stone above (see Photo 16 and Note D on Sketch 5).**
- **(S/A Deficiency) East end - 3ft wide x 2ft-6in high x up to 21in deep void due to missing stones around utility pipe (see Photo 17 and Note H on Sketch 5).**

For a complete list of Item 60.1.d - Breastwalls deficiencies, see **Sketch 5**. For an additional photo of deficiencies, **see Photo 18**.

Sketch / Photo Log

- Sketch 1 : Location Map
 Sketch 2 : Plan View
 Sketch 3 : East and West Elevations
 Sketch 4 : Underside Deficiencies
 Sketch 5 : Breastwall Deficiencies
 Photo 1 : West Elevation
 Photo 2 : East Elevation
 Photo 3 : Span 1, Concrete Slab/Encasement No. 3 - Spall/void at interface with granite slab, with original curb stones visible.
 Photo 4 : Span 1, Between West Fascia and Sidewalk Beam - Spall with exposed transverse and longitudinal bars on underside of deck slab.
 Photo 5 : West Fascia Beam - Extensive spalling to West face with exposed heavily corroded rebar with up to 75% section loss.
 Photo 6 : Span 1, West Sidewalk Beam - Extensive spalling to bottom face with exposed corroded rebar with up to 50% section loss.
 Photo 7 : Span 1, East Sidewalk Beam - 1/4in wide longitudinal crack with rust staining along bottom edge of East face with sections of delam. below.
 Photo 8 : Span 1, East Fascia Beam - Hollow area on the bottom face containing a full length crack and rust spots throughout.
 Photo 9 : Span 1, Steel I-Beam No. 1 - Heavy surface corrosion and laminar rust to bottom flange with up to 100% section loss along the edges.
 Photo 10 : Span 2, Granite Slab No. 6 - Full width x 1/2in wide transverse crack at midspan extending up to full visible height on both vertical faces.
 Photo 11 : Span 2, Granite Slab No. 8 - Full width x 1/8in wide transverse crack.
 Photo 12 : Span 2, Granite Slab No. 10 - 4in long x 2in wide x 5in high split section at northwest corner of granite slab.
 Photo 13 : West Transverse Sidewalk Beam, North Face - Up to 2.5in deep edge spall with exposed rebar and adjacent delam. in process of spalling.
 Photo 14 : West Transverse Sidewalk Beam, South Face - 2.5in deep spall with surrounding delamination up to 10in high.

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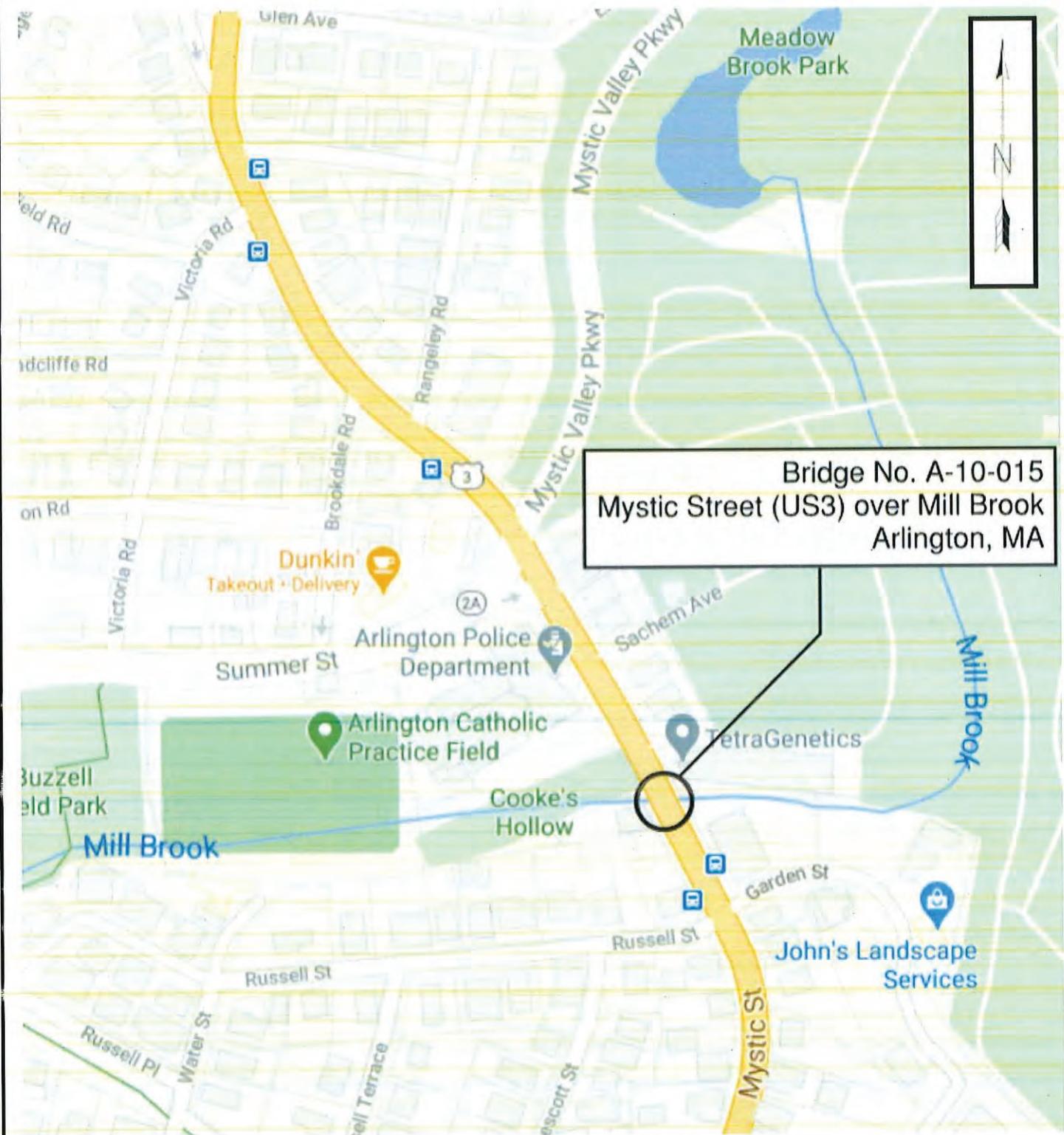
REMARKS**Sketch / Photo Log (Cont'd)**

- Photo 15 : Span 1, West Fascia Beam - Longitudinal hairline cracks with efflo., small areas of surrounding delam. and scaling at midspan.
- Photo 16 : North Breastwall Near West End - 5ft-6in wide x 7.5in high x up to 2ft deep void due to missing stones undermining stone above.
- Photo 17 : North Breastwall Near East End - 3ft wide x 2ft-6in high x up to 21in deep void due to missing stones around drain pipe.
- Photo 18 : South Breastwall Near West End - 18in wide x 10in high x up to 16in deep void directly below pipe.

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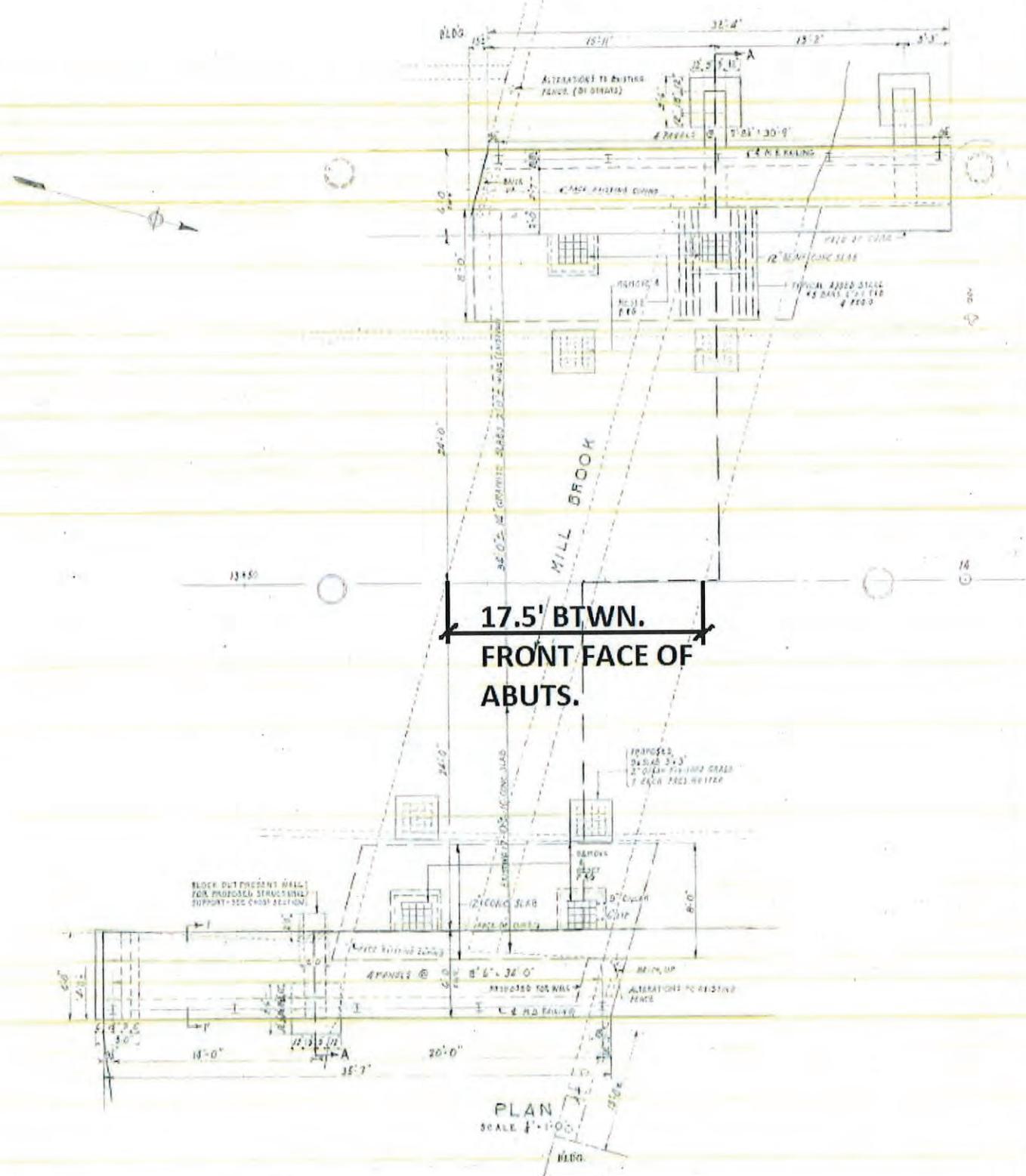
8.-STRUCTURE NO.

A10015-7XF-MUN-BRI

INSPECTION DATE
JUL 29, 2021**SKETCHES**

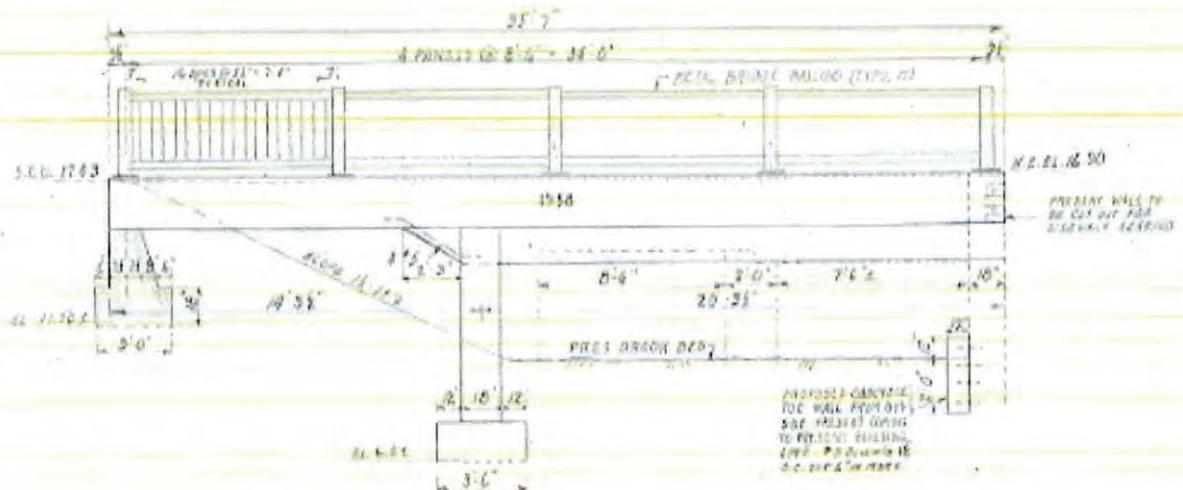
Sketch 1: Location Map

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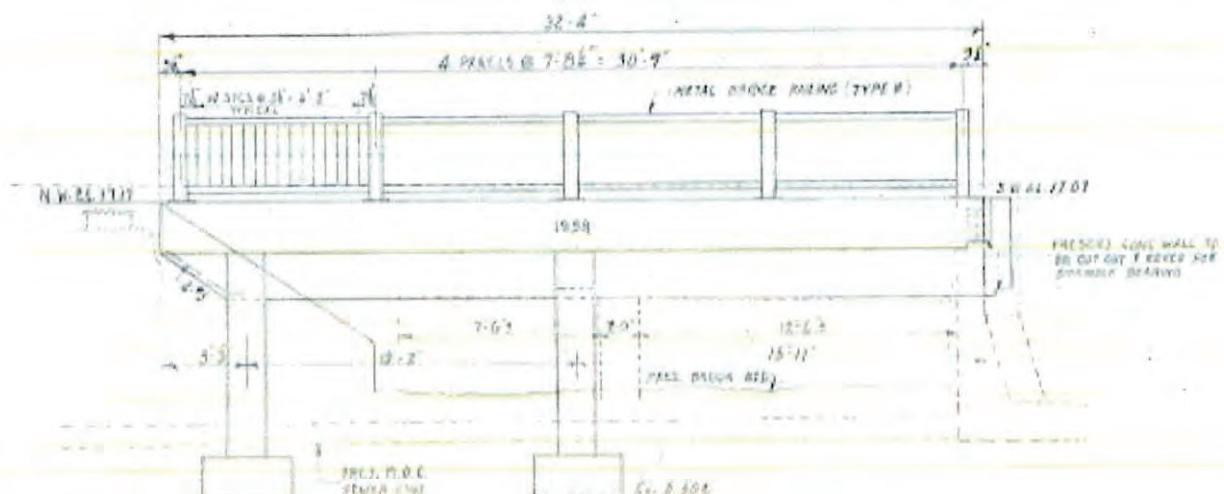
SKETCHES**Sketch 2: Plan View**

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SKETCHES



EASTERLY ELEVATION
SCALE, 1'-0"



WESTERLY ELEVATION
SCALE 1"-10'

Sketch 3: East and West Elevations

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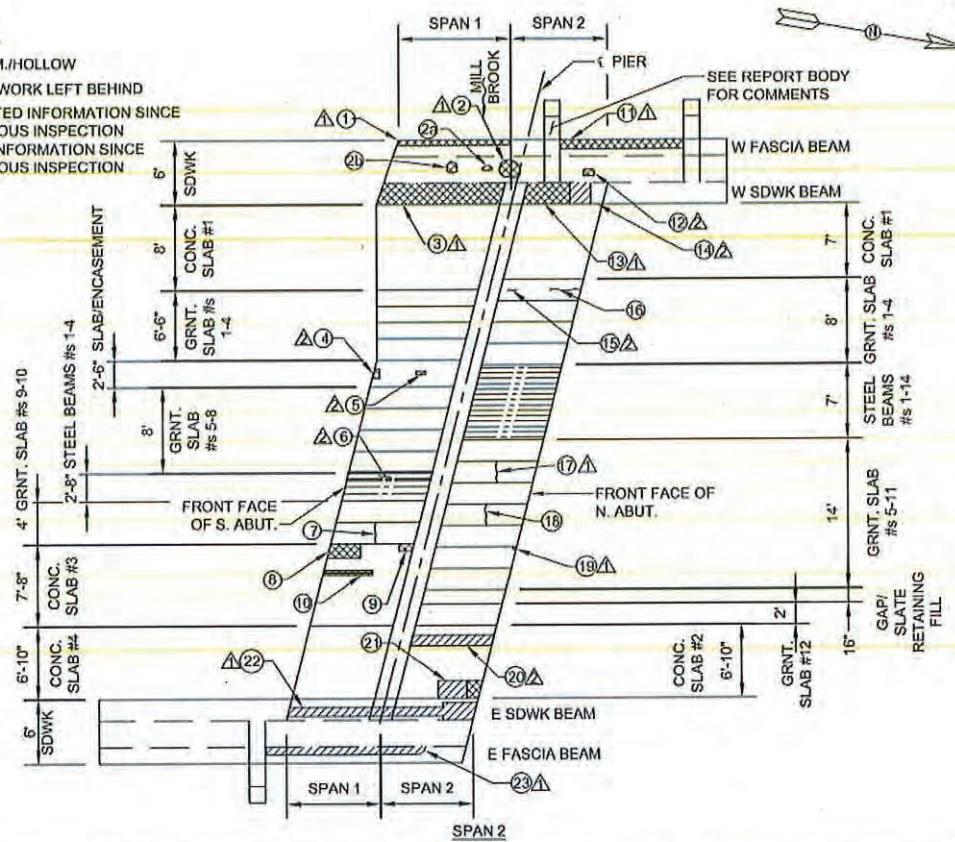
A10015-7XF-MUN-BRI

INSPECTION DATE
JUL 29, 2021

SKETCHES

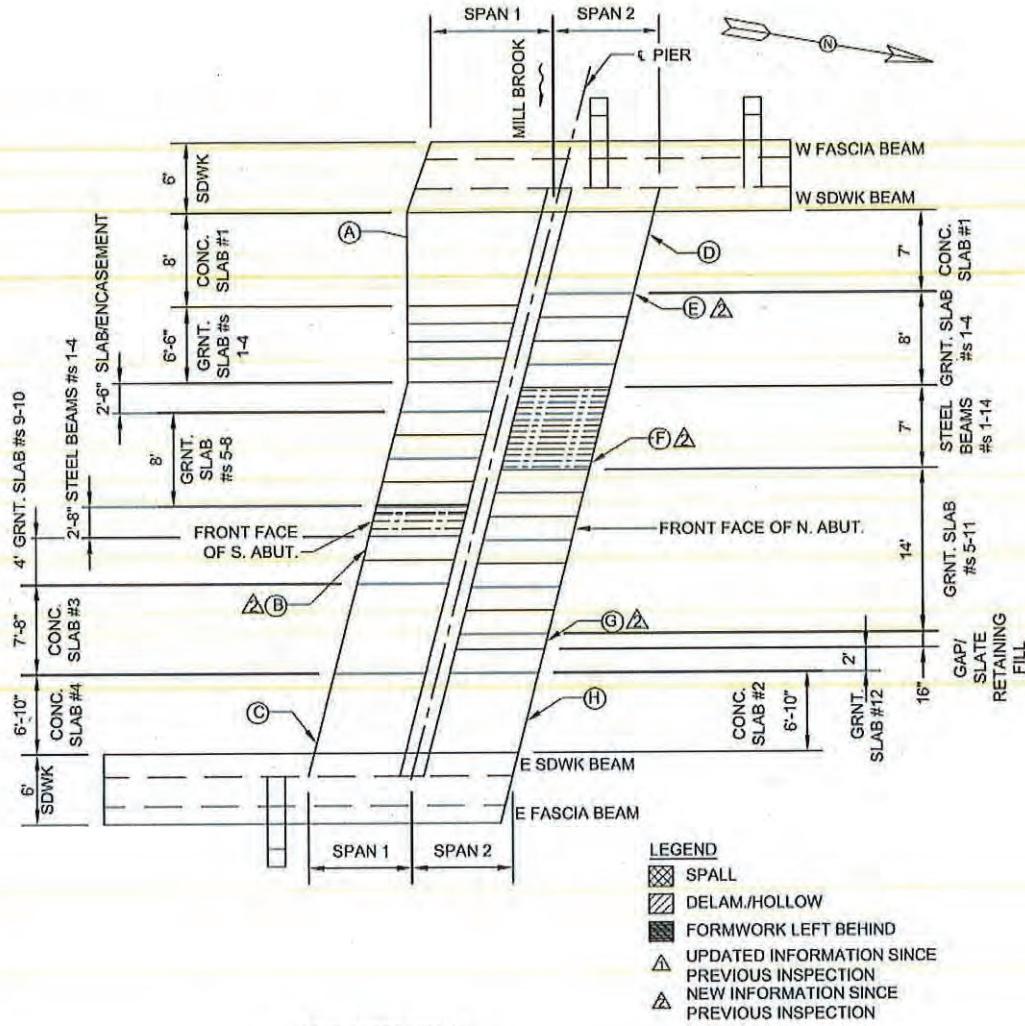
LEGEND

- █ SPALL
- █ DELAM./HOLLOW
- █ FORMWORK LEFT BEHIND
- △ UPDATED INFORMATION SINCE PREVIOUS INSPECTION
- △ NEW INFORMATION SINCE PREVIOUS INSPECTION



- △ 1. FL OF SPAN x 12in H x 6in D SPALL WITH EXPOSED REBAR WITH UP TO 75% SECTION LOSS ALONG THE TOP EDGE OF W FASCIA. BOTTOM FACE OF BEAM HAS SEVERAL LONGITUDINAL HAIRLINE CRACKS THROUGHOUT BOTH SPANS W/ EFFLO., SMALL AREAS OF SURROUNDING DELAM. AND A 2ft L X UP TO FW X UP TO 1in D AREA OF SCALING AT MIDSPAN. 3ft-6in L x 2in W x 2in H SPALL ALONG BOTTOM WEST EDGE
- △ 2. 2ft L x 22in W x 1.5in D SPALL W/ (3) TRANSVERSE BARS AND (1) LONGITUDINAL BAR EXPOSED ON UNDERSIDE OF DECK SLAB
- 2a. 5in L x 12in W x 1.5in D SPALL W/ (1) TRANSVERSE BAR EXPOSED ON UNDERSIDE OF DECK SLAB
- 2b. 12in L x 12in W x 1.5in D SPALL W/ (2) TRANSVERSE BARS EXPOSED ON UNDERSIDE OF DECK SLAB
- △ 3. FL OF SPAN x FW x 3in D SPALL ON BOTTOM FACE OF SIDEWALK BEAM CONTAINING EXPOSED TRANSVERSE AND LONGITUDINAL BARS W/ AREAS OF SECTION LOSS UP TO 50% AND (1) BROKEN BAR NEAR MIDSPAN
- △ 4. 7in L x 10in W x UP TO 1.5in D SPALL IN ENCASEMENT AT SOUTH ABUTMENT EXPOSING BOTTOM FLANGE OF BEAMS ABOVE
- △ 5. 10in L x 4in W x 1.5in D SPALL W/ EXPOSED BOTTOM FLANGE OF BEAM ABOVE
- △ 6. STEEL BEAM HAS HEAVY SURFACE CORROSION AND LAMINAR RUST TO BOTTOM FLANGE W/ ISOLATED AREAS OF UP TO 100% SECTION LOSS ALONG THE EDGES
7. FW TRANSVERSE HAIRLINE CRACK IN GRANITE SLAB AT MIDSPAN
8. 3ft L x 18in W x 1in D SPALL/VOID AT INTERFACE W/ GRANITE SLAB. GRANITE CURB STONES FROM ORIGINAL CONSTRUCTION ARE VISIBLE
9. 16in L x 8in W x 8in D SPALL/VOID AT INTERFACE W/ GRANITE SLAB
10. 4ft-8in L x 5in W TIMBER FORMWORK LEFT BEHIND
- △ 11. FL OF SPAN x UP TO FW SPALL CONTAINING EXPOSED REBAR W/ HEAVY SURFACE CORROSION AND UP TO 75% SECTION LOSS; SPALL EXTENDS UP TO 16in W ON TOP FACE AND UP TO 10in W ON BOTTOM FACE
- △ 12. 18in L x 7in W x UP TO 1in D SPALL W/ EXPOSED REBAR ON UNDERSIDE OF DECK SLAB
- △ 13. 4ft-6in L x FW x 3in D SPALL W/ EXPOSED REBAR ON BOTTOM FACE OF SDWK BEAM W/ ADJACENT 2ft L x FW DELAM. 4ft L x 1/16in W HORIZONTAL CRACK W/ RUST STAINING ON WEST FACE
- △ 14. 18in L AREA OF ACTIVE LEAKAGE AND RUST STAINING AT JOINT BETWEEN SDWK BEAM AND CONCRETE SLAB/ENCASEMENT
- △ 15. 12in L LONGITUDINAL HAIRLINE CRACK IN GRANITE SLAB
16. 3ft L LONGITUDINAL HAIRLINE CRACK IN GRANITE SLAB
- △ 17. FW x 1/2in W TRANSVERSE CRACK IN GRANITE SLAB AT MIDSPAN EXTENDING UP TO FULL VISIBLE HEIGHT ON BOTH VERTICAL FACES
18. FW x 1/8in W TRANSVERSE CRACK IN GRANITE SLAB AT MIDSPAN
- △ 19. 4in L x 2in W x 5in H SPLIT SECTION AT NORTHWEST CORNER OF GRANITE SLAB
- △ 20. FL x 12in W AREA CONTAINING LONGITUDINAL HAIRLINE CRACKS W/ EFFLO., RUST STAINING AND SMALL AREAS OF SURROUNDING DELAM.
21. 18in L x 20in W x 3in D SPALL CONTAINING EXPOSED REBAR W/ UP TO 50% SECTION LOSS ON CONCRETE SLAB/ENCASEMENT; ADJACENT 2ft-8in L x 20in W DELAM.
- △ 22. FL OF BOTH SPANS x UP TO 19in W DELAM. W/ RUST STAINING ON BOTTOM FACE ADJACENT TO HAIRLINE LONGITUDINAL CRACK. FL OF BOTH SPANS x UP TO 1/4in W LONGITUDINAL CRACK ALONG BOTTOM EDGE OF E FACE W/ RUST STAINING AND SECTIONS OF DELAM. BELOW
- △ 23. 10.5 ft. L x 9in. W HOLLOW AREA ON THE BOTTOM FACE OF THE FASCIA BEAM W/ RUST SPOTS THROUGHOUT, SURROUNDING A FULL LENGTH x 1/16in W CRACK

Sketch 4: Underside Deficiencies

CITY/TOWN
ARLINGTONB.I.N.
7XFBR. DEPT. NO.
A-10-0158.-STRUCTURE NO.
A10015-7XF-MUN-BRIINSPECTION DATE
JUL 29, 2021**SKETCHES**SOUTH BREASTWALL

- A. 18in W x 10in H x UP TO 16in D VOID DIRECTLY BELOW PIPE
- △ B. 27in W x 7in H x UP TO 21in D VOID UNDERMINING STONE
- C. LOOSE STONES AND DETERIORATED MASONRY AND MORTAR

NORTH BREASTWALL

- D. 5ft-6in W x 7.5in H x UP TO 2ft D VOID DUE TO MISSING STONES UNDERMINING THE STONE ABOVE
- △ E. 2ft-6in W x UP TO 6in H x UP TO 18in D VOID DUE TO MISSING CHINKING STONES W/ ADJACENT 8in W x UP TO 12in H x UP TO 12in D VOID
- △ F. 2ft-6in W x 6in H x UP TO 14in D AREA OF VOIDS DUE TO MISSING STONES ABOVE
- △ G. 18in W x UP TO 18in H x UP TO 20in D VOID UNDERMINING STONE
- H. 3ft W x 2ft-6in H x UP TO 21in D VOID DUE TO MISSING STONES AROUND DRAIN PIPE

Sketch 5: Breastwall Deficiencies

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 29, 2021
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PHOTOS

Photo 1: West Elevation



Photo 2: East Elevation

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 29, 2021
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PHOTOS

Photo 3: Span 1, Concrete Slab/Encasement No. 3 - Spall/void at interface with granite slab, with original curb stones visible.



Photo 4: Span 1, Between West Fascia and Sidewalk Beam - Spall with exposed transverse and longitudinal bars on underside of deck slab.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 29, 2021
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PHOTOS

Photo 5: West Fascia Beam - Extensive spalling to West face with exposed heavily corroded rebar with up to 75% section loss.



Photo 6: Span 1, West Sidewalk Beam - Extensive spalling to bottom face with exposed corroded rebar with up to 50% section loss.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 29, 2021
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PHOTOS

Photo 7: Span 1, East Sidewalk Beam - 1/4in wide longitudinal crack with rust staining along bottom edge of East face with sections of delam. below.



Photo 8: Span 1, East Fascia Beam - Hollow area on the bottom face containing a full length crack and rust spots throughout.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 29, 2021
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PHOTOS



Photo 9: Span 1, Steel I-Beam No. 1 - Heavy surface corrosion and laminar rust to bottom flange with up to 100% section loss along the edges.



Photo 10: Span 2, Granite Slab No. 6 - Full width x 1/2in wide transverse crack at midspan extending up to full visible height on both vertical faces.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 29, 2021
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PHOTOS



Photo 11: Span 2, Granite Slab No. 8 - Full width x 1/8in wide transverse crack.



Photo 12: Span 2, Granite Slab No. 10 - 4in long x 2in wide x 5in high split section at northwest corner of granite slab.

CITY/TOWN
ARLINGTONB.I.N.
7XFBR. DEPT. NO.
A-10-0158.-STRUCTURE NO.
A10015-7XF-MUN-BRIINSPECTION DATE
JUL 29, 2021**PHOTOS**

Photo 13: West Transverse Sidewalk Beam, North Face - Up to 2.5in deep edge spall with exposed rebar and adjacent delam. in process of spalling.



Photo 14: West Transverse Sidewalk Beam, South Face - 2.5in deep spall with surrounding delamination up to 10in high.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 29, 2021
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PHOTOS

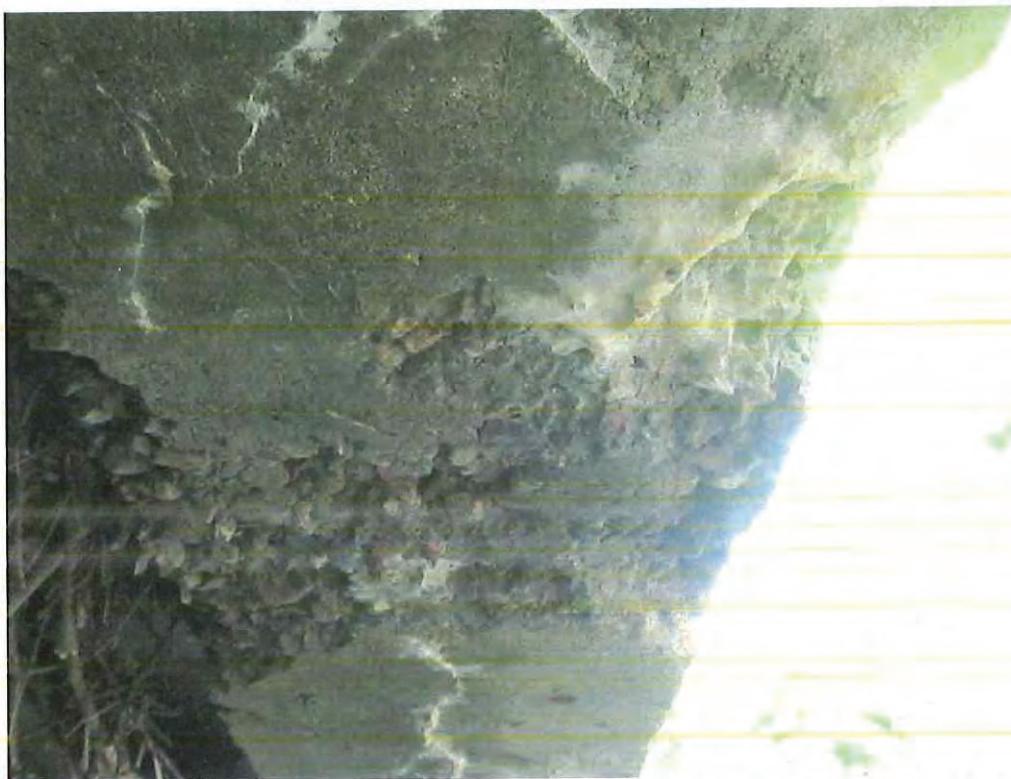


Photo 15: Span 1, West Fascia Beam - Longitudinal hairline cracks with efflo., small areas of surrounding delam. and scaling at midspan.



Photo 16: North Breastwall Near West End - 5ft-6in wide x 7.5in high x up to 2ft deep void due to missing stones undermining stone above.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 29, 2021
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PHOTOS



Photo 17: North Breastwall Near East End - 3ft wide x 2ft-6in high x up to 21in deep void due to missing stones around drain pipe.



Photo 18: South Breastwall Near West End - 18in wide x 10in high x up to 16in deep void directly below pipe.

REPORT F

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 13

2-DIST

B.I.N.

04

7XF

STRUCTURES INSPECTION FIELD REPORT

SPECIAL MEMBER INSPECTION

BR. DEPT. NO.

A-10-015

CITY/TOWN ARLINGTON	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	11-KILO. POINT 000.000	90-ROUTINE INSP. DATE Jan 16, 2019	93*-SPEC. MEMB. INSP. DATE Jul 8, 2020																						
07-FACILITY CARRIED US 3 MYSTIC ST	MEMORIAL NAME/LOCAL NAME	27-YR BUILT 1850	106-YR REBUILT 1958	*YR REHAB'D (NON 106) 0000																						
06-FEATURES INTERSECTED WATER MILL BROOK	26-FUNCTIONAL CLASS Urban Arterial	DIST. BRIDGE INSPECTION ENGINEER <i>J. Dideo</i>																								
43-STRUCTURE TYPE 801 : Masonry Slab	22-OWNER Town Agency	21-MAINTAINER Town Agency	TEAM LEADER D. Suarez <i>D. Suarez</i>																							
107-DECK TYPE 9 : Other	WEATHER Clear	TEMP. (air) 25°C	TEAM MEMBERS T. LEIPER	<i>D. Suarez</i>																						
WEIGHT POSTING	<i>Not Applicable</i>	X	At bridge	Advance																						
Actual Posting	H 3 3S2 Single	<table border="1"><tr><td>N</td><td>N</td><td>N</td><td>N</td></tr></table>	N	N	N	N	<table border="1"><tr><td>N</td><td>S</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	N	S					<table border="1"><tr><td>N</td><td>S</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	N	S										
N	N	N	N																							
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Recommended Posting	<table border="1"><tr><td>N</td><td>N</td><td>N</td><td>N</td></tr></table>	N	N	N	N	<table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>							<table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>							<table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>						
N	N	N	N																							
Waived Date:	00/00/0000	EJDMT Date:	00/00/0000	PLANS (Y/N): Y																						
			(V.C.R.) (Y/N): N	TAPE#:																						

RATING

Rating Report (Y/N): **N**Date: **-----**Recommend for Rating or Rerating (Y/N): **N**

If YES please give priority:

HIGH () MEDIUM () LOW ()

REASON:

Inspection data at time of existing rating
158: - 159: - 160: - 162: - Date: 00/00/0000

SPECIAL MEMBER(S):

	MEMBER	CRACK (Y/N):	WELD'S CONDITION (0-9)	LOCATION OF CORROSION, SECTION LOSS (%), CRACKS, COLLISION DAMAGE, STRESS CONCENTRATION, ETC.	CONDITION		INV. RATING OF MEMBER FROM RATING ANALYSIS			Deficiencies
					PREVIOUS (0-9)	PRESENT (0-9)	H-20	3	3S2	
A	Item 58.2 - Deck Condition	N		See remarks in comments section.	3	3				S-A
B	Item 59.4 - Girders or Beams	N		See remarks in comments section.	3	3				S-A
C	Item 60.1.d - Breastwalls	N		See remarks in comments section.	4	4				S-A
D										
E										

List of field tests performed:

I-58 I-59 I-60 I-62

(Overall Previous Condition)

3	3	4	-
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(Overall Current Condition)

3	3	4	-
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DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion of steel, Minor scouring, Clogged drainage, etc.

S= Severe/Major Deficiency - Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroded rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.

C-S= Critical Structural Deficiency - A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

C-H= Critical Hazard Deficiency - A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.

URGENCY OF REPAIR:

I= Immediate - Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the Deficiency and to receive further instruction from him/her.

A= ASAP - Action/Repair should be initiated by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) upon receipt of the Inspection Report.

P= Prioritize - Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available.

X=UNKNOWN

N=NOT APPLICABLE

H=HIDDEN/INACCESSIBLE

R=REMOVED

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 8, 2020
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REMARKS**BRIDGE ORIENTATION**

A-10-015 (7XF) carries US3 Mystic Street over Mill Brook. According to the 1958 design plans, the two spans are numbered from south to north (span 1 and span 2, respectively). The elevations are labeled west and east. Mill Brook flows from west to east.

GENERAL REMARKS

The original structure was built prior to 1958 at an estimated date of 1850 using granite slabs. In 1958, the structure was widened by adding two reinforced concrete slabs (see **Sketch 1**) for approximate locations. Narrow steel I beam sections or possibly rail road tracks were added later. The abutments and pier are comprised of masonry walls.

ITEM 58 - DECK**Item 58.2 - Deck Condition**

The deck consists of 10 granite slabs in the south span (span 1), and 12 granite slabs in the north span (span 2). Because of a full width transverse crack found in two of the granite slabs in the north span, a 30" long longitudinal crack found in one of the granite slabs in the north span, and one full width crack found in one of the slabs in the south span, the deck is rated a "3".

Refer to Item 59.4 for deficiencies related to the granite slabs.

ITEM 59 - SUPERSTRUCTURE**Item 59.4 - Girders or Beams****GENERAL NOTES:**

There are 4 narrow steel beams in the south span and 14 steel beams in the north span that are not included in the 1958 plans, and are believed to have been installed at some point after the structure was widened. The beams have a 5-1/2" wide bottom flange and are placed abutting one another so only the bottom face of the bottom flange is visible. There is moderate rust and lamination along all the bottom flanges (**Photos 1 & 2**).

SIDEWALK BEAMS:

The west sidewalk beam is severely spalled with exposed rebar measuring full length x up to 24" height x up to 11" deep, with scaling along the top up to 16" deep from fascia (**Photo 3**).

In span 1, the interior west sidewalk beam has a spall measuring full length x full width x up to 3" deep with exposed rebar and 100% section loss to the stirrups (**Photo 4**).

In span 2, the interior west sidewalk beam has a spall adjacent to the pier wall measuring 4' long x 2' wide x up to 3" deep with exposed rebar, and has heavy delamination along the bottom face for the rest of the span length (**Photo 5**).

There is spalling throughout the west sidewalk transverse support beam full width across the bottom face and up both north and south faces up to 12" (**Photo 6**).

The east sidewalk beams both have longitudinal cracking, delamination, rust staining along the bottom face and the east face (**Photo 7**).

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 8, 2020
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REMARKS**Item 59.4 - Girders or Beams (Cont'd)****INTERIOR BEAMS:**

In Span 1:

The second concrete slab from the east has a spall at the southwest corner measuring 2' wide x up to 3' long, exposing granite blocks and asphalt above (**Photo 8**).

The 1st granite beam from the east has a transverse hairline crack at mid-span of beam, below the utility pipe.

In Span 2:

There is a spall on the northeast corner of the eastern most concrete slab measuring up to 2' long x up to 1' 1/2" wide x up to 2" deep with exposed rebar (**Photo 9**).

The fifth granite slab from the east has a full width hairline crack at midspan. It could not be determined if the crack was full height due to adjacent slab proximity (**Photo 10**).

The seventh granite slab from the east has a 1/4" wide full width x full height crack at midspan (**Photo 11**).

The first granite slab from the west has a 30" long longitudinal hairline crack adjacent to the north breastwall (**Photo 12**).

ITEM 60 - SUBSTRUCTURE**Item 60.1 - Abutments****Item 60.1.d - Breastwalls**

There are several missing chinking stones/ pointing throughout both breastwalls, particularly around the drain pipes.

At the south breastwall, west corner, there is a void below the drain pipe measuring: 18" long x 10" high x 16" deep (**Photo 13**).

At the south breastwall, east end, there are loose stones with deteriorated masonry and mortar (**Photo 14**).

At the north breastwall, 5' from the east end, there is a void area around drainage pipe measuring 2.5' long x 2' high x 2' deep (**Photo 15**).

At the north breastwall, 5' from the west end, there are voids above the 1st course of blocks and one void over the 2nd course (**Photo 16**).

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 8, 2020
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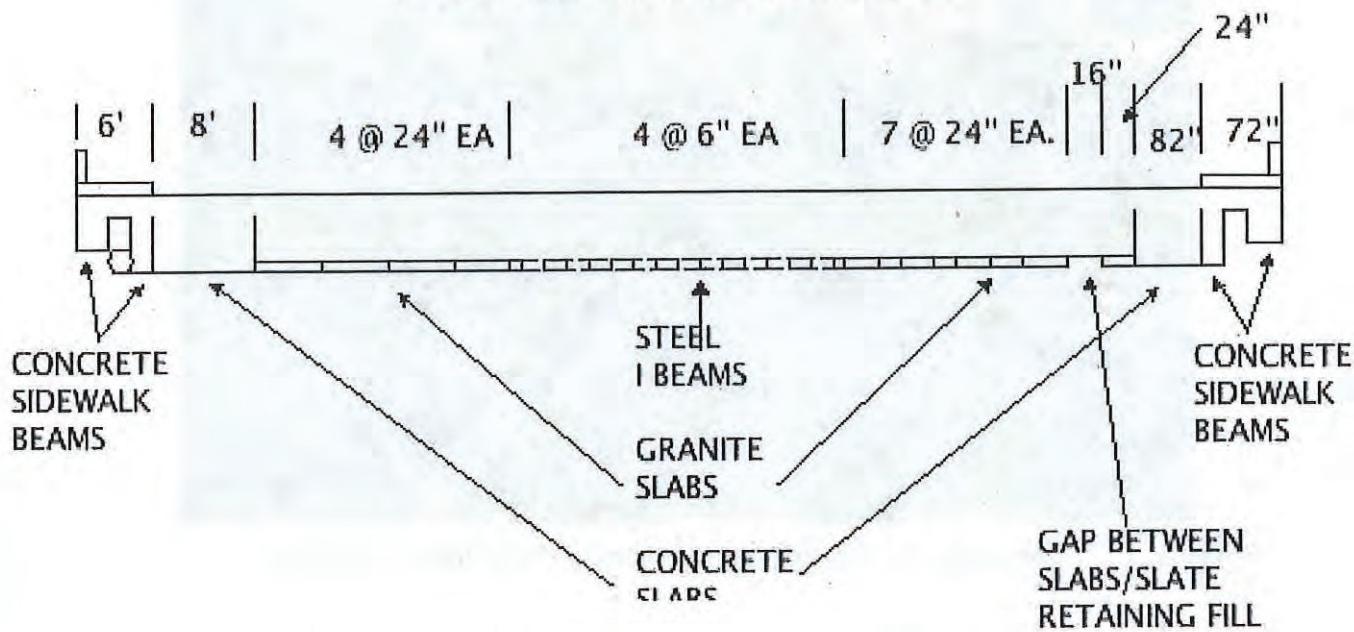
REMARKS**Sketch / Photo Log**

- Sketch 1 : SPAN 1 AND SPAN 2 STRUCTURAL COMPOSITION
- Photo 1 : Span 1: first and fourth steel I-beams show heavy lamination
- Photo 2 : Span 2: typical rusting along steel I-beams
- Photo 3 : West sidewalk beam: severely spalled with exposed rebar measuring full length x up to 24" height x up to 11" deep
- Photo 4 : Interior west sidewalk beam: spall measuring full length x full width x up to 3" deep with exposed rebar and 100% section loss to the stirrups
- Photo 5 : Interior west sidewalk beam: spall in span 2 adjacent to the pier wall measuring 4' long x 2' wide x up to 3" deep with exposed rebar
- Photo 6 : West sidewalk transverse support beam: spalling full width across the bottom face and up both north and south faces up to 12"
- Photo 7 : East sidewalk beam: longitudinal cracking, delamination, rust staining along the bottom face and the east face
- Photo 8 : Second concrete slab from the east: spall at the southwest corner measuring 2' wide x up to 3' long
- Photo 9 : Spall on the northeast corner of the eastern most concrete slab measuring up to 2' long x up to 1' 1/2" wide x up to 2" deep with exposed rebar
- Photo 10 : Fifth granite slab from the east: full width hairline crack at midspan
- Photo 11 : Seventh granite slab from the east has a 1/4" wide full width x full height crack at midspan
- Photo 12 : First granite slab from the west has a 30" long longitudinal hairline crack adjacent to the north breastwall
- Photo 13 : South breastwall, west corner: void below the drain pipe measuring: 18" long x 10" high x 16" deep
- Photo 14 : South breastwall, east end: loose stones with deteriorated masonry and mortar
- Photo 15 : North breastwall, east end: void area around drainage pipe measuring 2.5' long x 2' high x 2' deep
- Photo 16 : North breastwall, west end: voids above the 1st course of blocks and one void over the 2nd course

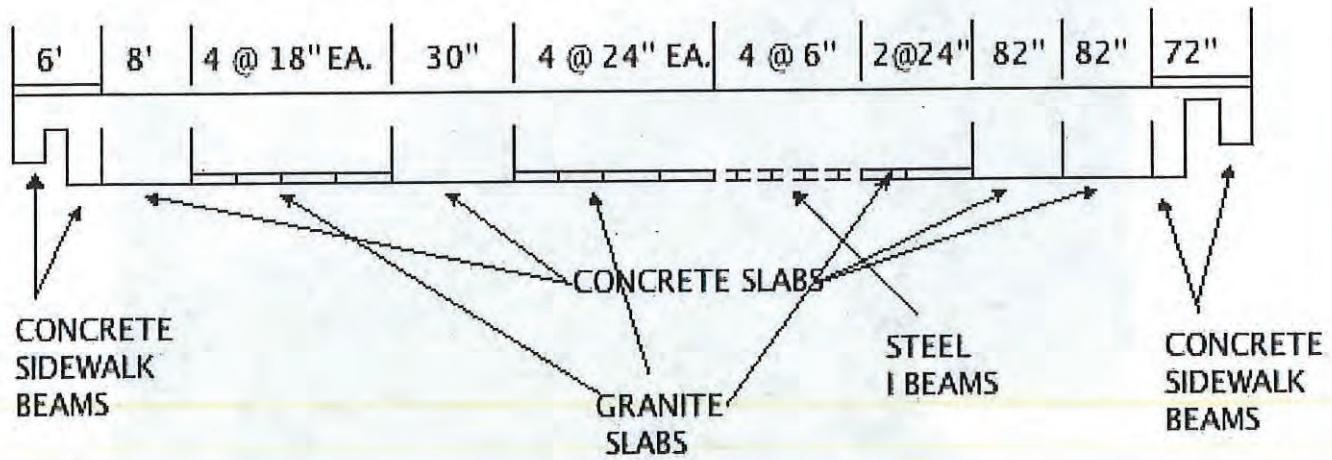
CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 8, 2020
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SKETCHES

SPAN 2 NORTH SPAN LOOKING NORTH



SPAN 1 SOUTH SPAN LOOKING NORTH



Sketch 1: SPAN 1 AND SPAN 2 STRUCTURAL COMPOSITION

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 8, 2020
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PHOTOS

Photo 1: Span 1: first and fourth steel I-beams show heavy lamination



Photo 2: Span 2: typical rusting along steel I-beams

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8. STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 8, 2020
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PHOTOS

Photo 3: West sidewalk beam: severely spalled with exposed rebar measuring full length x up to 24" height x up to 11" deep



Photo 4: Interior west sidewalk beam: spall measuring full length x full width x up to 3" deep with exposed rebar and 100% section loss to the stirrups

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 8, 2020
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PHOTOS

Photo 5: Interior west sidewalk beam: spall in span 2 adjacent to the pier wall measuring 4' long x 2' wide x up to 3" deep with exposed rebar



Photo 6: West sidewalk transverse support beam: spalling full width across the bottom face and up both north and south faces up to 12"

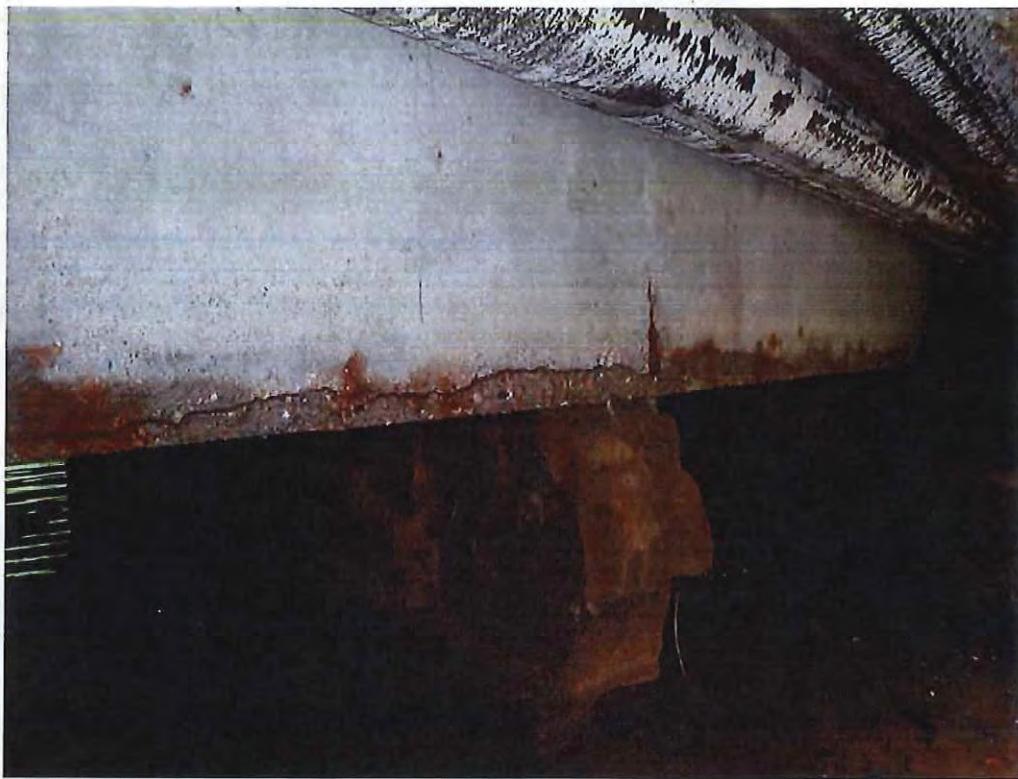
CITY/TOWN
ARLINGTONB.I.N.
7XFBR. DEPT. NO.
A-10-0158. STRUCTURE NO.
A10015-7XF-MUN-BRIINSPECTION DATE
JUL 8, 2020**PHOTOS**

Photo 7: East sidewalk beam: longitudinal cracking, delamination, rust staining along the bottom face and the east face



Photo 8: Second concrete slab from the east: spall at the southwest corner measuring 2' wide x up to 3' long

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 8, 2020
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PHOTOS

Photo 9: Spall on the northeast corner of the eastern most concrete slab measuring up to 2' long x up to 1' 1/2" wide x up to 2" deep with exposed rebar



Photo 10: Fifth granite slab from the east: full width hairline crack at midspan

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 8, 2020
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PHOTOS

Photo 11: Seventh granite slab from the east has a 1/4" wide full width x full height crack at midspan



Photo 12: First granite slab from the west has a 30" long longitudinal hairline crack adjacent to the north breastwall

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 8, 2020
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PHOTOS

Photo 13: South breastwall, west corner: void below the drain pipe measuring:
18" long x 10" high x 16" deep



Photo 14: South breastwall, east end: loose stones with deteriorated masonry
and mortar

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 8, 2020
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PHOTOS

Photo 15: North breastwall, east end: void area around drainage pipe measuring 2.5' long x 2' high x 2' deep



Photo 16: North breastwall, west end: voids above the 1st course of blocks and one void over the 2nd course

REPORT E
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 12

STRUCTURES INSPECTION FIELD REPORT

SPECIAL MEMBER INSPECTION

BR. DEPT. NO.
A-10-015

2-DIST
04

B.I.N.
7XF

CITY/TOWN
ARLINGTON

8-STRUCTURE NO.
A10015-7XF-MUN-BRI

11-KILO. POINT
000.000

90-ROUTINE INSP. DATE
Jan 16, 2019

93*-SPEC. MEMB. INSP. DATE
Jan 24, 2020

07-FACILITY CARRIED

US 3 MYSTIC ST

MEMORIAL NAME/LOCAL NAME

27-YR BUILT

106-YR REBUILT

*YR REHAB'D (NON 106)

1850

1958

0000

06-FEATURES INTERSECTED

WATER MILL BROOK

26-FUNCTIONAL CLASS

Urban Arterial

DIST. BRIDGE INSPECTION ENGINEER

J. Dideo

43-STRUCTURE TYPE

801 : Masonry Slab

22-OWNER

Town Agency

21-MAINTAINER

Town Agency

TEAM LEADER D. *Suarez

Joseph Dideo
David Suarez

107-DECK TYPE

9 : Other

WEATHER

Clear

TEMP. (air)

30°C

TEAM MEMBERS

O. MOUSTAFA

WEIGHT POSTING

Not Applicable

X

H	3	3S2	Single
N	N	N	N
N	N	N	N

Actual Posting

Recommended Posting

Waived Date: **00/00/0000**

EJDMT Date: **00/00/0000**

Signs In Place
(Y=Yes,N=No,
NR=Not Required)

Legibility/
Visibility

At bridge

N	S

Advance

N	S

PLANS

Y

(V.C.R.)

N

TAPE#:

If YES please give priority:

HIGH () MEDIUM () LOW ()

RATING

Rating Report (Y/N): **N**

Date: **-----**

Recommend for Rating or Rerating (Y/N): **N**

REASON:



Inspection data at time of existing rating

158: - 159: - 160: - 162: - Date: **00/00/0000**

SPECIAL MEMBER(S):

MEMBER	CRACK (Y/N):	WELD'S CONDITION (0-9)	LOCATION OF CORROSION, SECTION LOSS (%), CRACKS, COLLISION DAMAGE, STRESS CONCENTRATION, ETC.	CONDITION		INV. RATING OF MEMBER FROM RATING ANALYSIS			Deficiencies
				PREVIOUS (0-9)	PRESENT (0-9)	H-20	3	3S2	
A Item 58.2 - Deck Condition	N		See remarks in comments section.	3	3	Not Rated			S-A
B Item 59.4 - Girders or Beams	N		See remarks in comments section.	3	3	Not Rated			S-A
C Item 60.1.d - Breastwalls	N		See remarks in comments section.	4	4	Not Rated			S-A
D									
E									

List of field tests performed:

I-58 I-59 I-60 I-62

3 3 4 -

3 3 4 -

(Overall Previous Condition)

(Overall Current Condition)

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pitting, Minor corrosion of steel, Minor scouring, Clogged drainage, etc.

S= Severe/Major Deficiency - Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroded rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.

C-S= Critical Structural Deficiency - A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

C-H= Critical Hazard Deficiency - A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.

URGENCY OF REPAIR:

I= Immediate - Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the Deficiency and to receive further instruction from him/her.

A= ASAP - Action/Repair should be initiated by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) upon receipt of the Inspection Report.

P= Prioritize - Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available.

X=UNKNOWN

N=NOT APPLICABLE

H=HIDDEN/INACCESSIBLE

R=REMOVED

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 24, 2020
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REMARKS

BRIDGE ORIENTATION

BRI A-10-015 (7XF) carries US3 Mystic Street over Mill Brook. According to the 1958 design plans, the two spans are numbered from south to north (span 1 and span 2, respectively). The elevations are labeled west and east. Mill Brook flows from west to east.

GENERAL REMARKS

The original structure was built prior to 1958 at an estimated date of 1850 using granite slabs. In 1958, the structure was widened by adding two reinforced concrete slabs (see **Sketch 1**) for approximate locations. Narrow steel I beam sections or possibly rail road tracks were added later. The abutments and pier are comprised of masonry walls.

ITEM 58 - DECK

Item 58.2 - Deck Condition

The deck consists of 10 granite slabs in the south span (span 1), and 12 granite slabs in the north span (span 2). Because of a full width transverse crack found in two of the granite slabs in the north span, a 30" long longitudinal crack found in one of the granite slabs in the north span, and one full width crack found in one of the slabs in the south span, the deck is rated a "3".

Refer to Item 59.4 for deficiencies related to the granite slabs.

ITEM 59 - SUPERSTRUCTURE

Item 59.4 - Girders or Beams

The granite slabs act as girders and are listed in this section.

GENERAL NOTES:

There are 4 narrow steel beams in the south span and 14 steel beams in the north span that are not included in the 1958 plans, and are believed to have been installed at some point after the structure was widened. The beams have a 5-1/2" wide bottom flange and are placed abutting one another so only the bottom face of the bottom flange is visible. There is moderate rust and lamination on the bottom flanges (**Photos 1 & 2**).

SIDEWALK BEAMS:

The west sidewalk beam is heavily spalled measuring full length x up to 24" height x up to 11" deep, with scaling along the top up to 16" deep from fascia (**Photo 3**).

In span 1, the interior west sidewalk beam has a spall measuring full length x full width x up to 3" deep with exposed rebar and 100% section loss to the stirrups (**Photo 4**).

In span 2, the interior west sidewalk beam has a spall adjacent to the pier wall measuring 4' long x 2' wide x up to 3" deep with exposed rebar, and has heavy delamination along the bottom face for the rest of the span length.

There is spalling throughout the west sidewalk transverse support beam full width across the bottom face and up both north and south faces up to 12" and heaviest at the western end (**Photo 5**).

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 24, 2020
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REMARKS

Item 59.4 - Girders or Beams (Cont'd)

The east sidewalk beams both have longitudinal cracking, delamination, rust staining along the bottom face and the east face (**Photo 6**).

INTERIOR BEAMS:

In Span 1:

The second concrete slab from the east has a spall at the southwest corner, exposing granite blocks and asphalt above (**Photo 7**).

The 1st granite beam from the east has a transverse hairline crack at mid-span of beam, below the utility pipe.

In Span 2:

The fifth granite slab from the east has a full width hairline crack at midspan. It could not be determined if the crack was full height due to adjacent slab proximity (**Photo 8**).

The seventh granite slab from the east has a 1/4" wide full width x full height crack at midspan (**Photo 9**).

The first granite slab from the west has a 30" long longitudinal hairline crack adjacent to the north breastwall.

There is a spall on the northeast corner of the eastern most concrete slab with exposed rebar (**Photo 10**).

ITEM 60 - SUBSTRUCTURE

Item 60.1 - Abutments

Item 60.1.d - Breastwalls

There are several missing chinking stones/ pointing throughout both breastwalls, particularly around the drain pipes.

At the south breastwall in the southwest corner, there is a void below the drain pipe measuring: 18" long X 10" high X 16" deep (**Photo 11**).

At the east end of the south breastwall, there are loose stones with deteriorated masonry and mortar (**Photo 12**).

At the north breastwall, 5' from the east end, there is a void area around drainage pipe measuring 2.5' long x 2' high x 2' deep (**Photo 13**).

At the north breastwall, 5' from the west end, there are voids above the 1st course of blocks and one void over the 2nd course (**Photo 14**).

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 24, 2020
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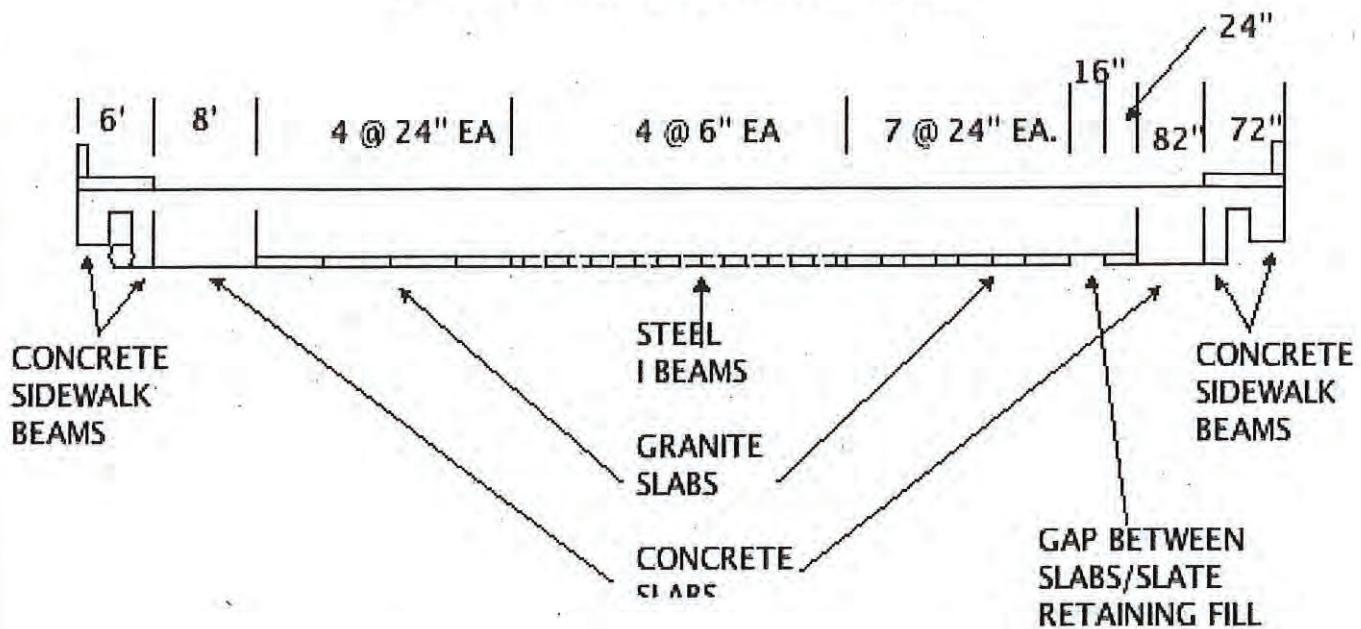
REMARKS**Sketch / Photo Log**

- Sketch 1 : SPAN 1 AND SPAN 2 STRUCTURAL COMPOSITION
- Photo 1 : Span 1: 4 Steel beams with moderate rust and heavy lamination .
- Photo 2 : Span 2: 14 steel beams with moderate rust and lamination.
- Photo 3 : West sidewalk beam: fascia is heavily spalled full length with exposed rebar.
- Photo 4 : Interior west sidewalk beam: spall full length x full width with exposed rebar and 100% section loss to the stirrups.
- Photo 5 : West transverse support beam: spalled full width across the bottom, north, and south faces up to 12".
- Photo 6 : East sidewalk beam: longitudinal cracking, delamination, and rust staining along the bottom and east faces.
- Photo 7 : Second concrete slab from the east: spall at the southwest corner exposing granite blocks and asphalt above.
- Photo 8 : Fifth granite slab from the east: full width hairline crack at midspan.
- Photo 9 : Seventh granite slab from the east: 1/4" wide full width x full height crack at midspan.
- Photo 10 : First concrete slab from the east: spall on the north east corner with exposed rebar.
- Photo 11 : South breastwall: southwest corner void below the drain pipe measuring 18" L x 10" H x 16" D.
- Photo 12 : South breastwall: at the east end there are loose stones with deteriorated masonry and mortar.
- Photo 13 : North breastwall: at the east end there is a void area around a drainage pipe measuring 2.5' L x 2' H x 2' D.
- Photo 14 : North breastwall: at the west end, there are voids above the 1st and 2nd course of blocks.

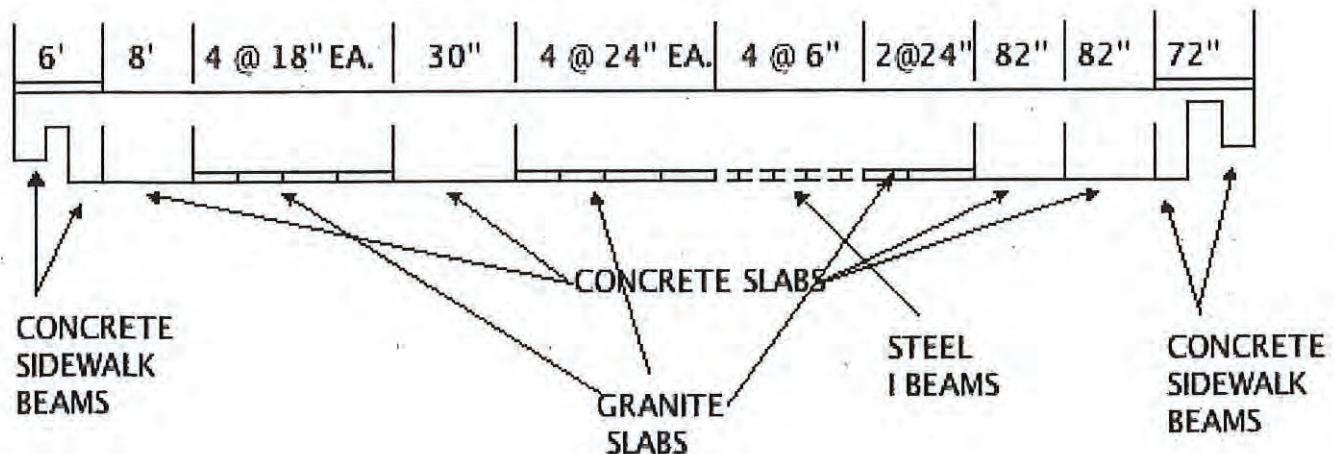
CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 24, 2020
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SKETCHES

SPAN 2 NORTH SPAN LOOKING NORTH



SPAN 1 SOUTH SPAN LOOKING NORTH



Sketch 1: SPAN 1 AND SPAN 2 STRUCTURAL COMPOSITION

CITY/TOWN
ARLINGTON

B.I.N.
7XF

BR. DEPT. NO.
A-10-015

8.-STRUCTURE NO.
A10015-7XF-MUN-BRI

INSPECTION DATE
JAN 24, 2020

PHOTOS

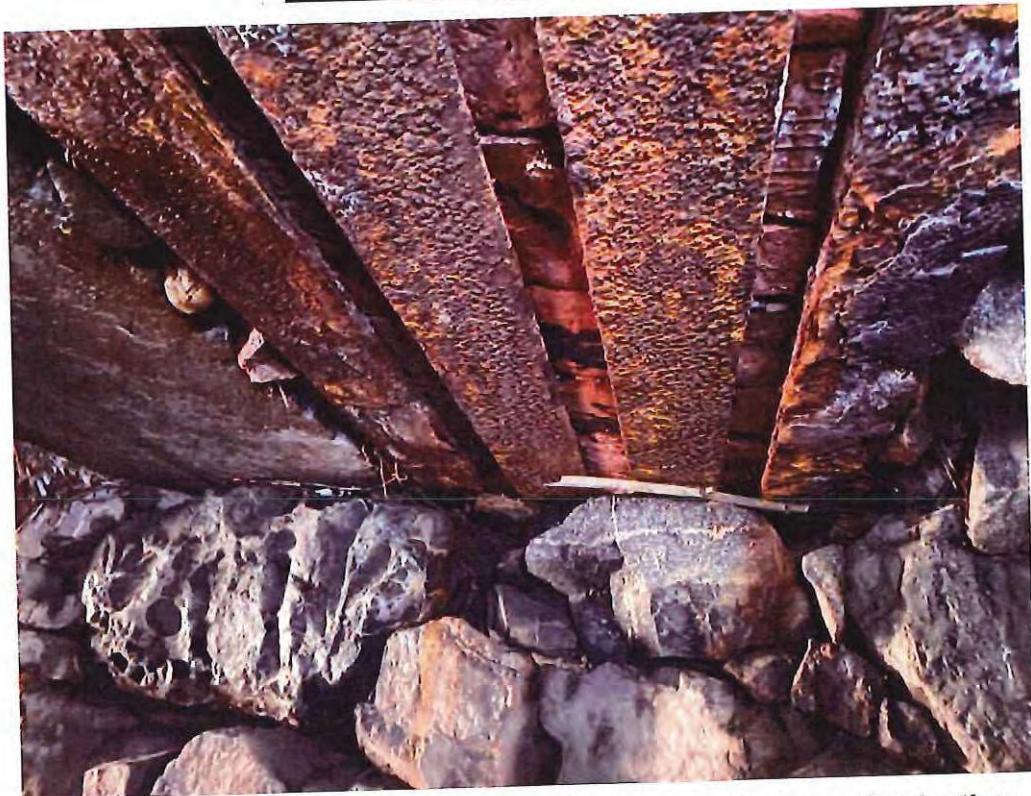


Photo 1: Span 1: 4 Steel beams with moderate rust and heavy lamination .

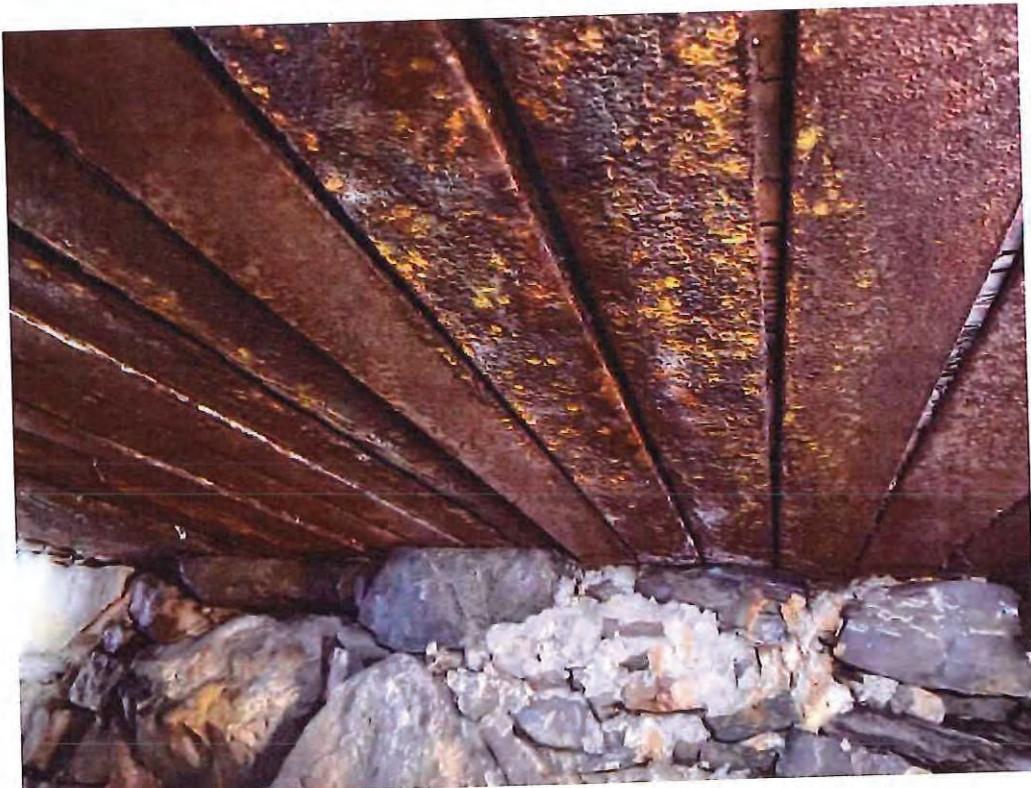


Photo 2: Span 2: 14 steel beams with moderate rust and lamination.

CITY/TOWN
ARLINGTON

B.I.N.
7XF

BR. DEPT. NO.
A-10-015

8.-STRUCTURE NO.
A10015-7XF-MUN-BRI

INSPECTION DATE
JAN 24, 2020

PHOTOS



Photo 3: West sidewalk beam: fascia is heavily spalled full length with exposed rebar.



Photo 4: Interior west sidewalk beam: spall full length x full width with exposed rebar and 100% section loss to the stirrups.

CITY/TOWN
ARLINGTONB.I.N.
7XFBR. DEPT. NO.
A-10-0158.-STRUCTURE NO.
A10015-7XF-MUN-BRIINSPECTION DATE
JAN 24, 2020**PHOTOS**

Photo 5: West transverse support beam: spalled full width across the bottom, north, and south faces up to 12".



Photo 6: East sidewalk beam: longitudinal cracking, delamination, and rust staining along the bottom and east faces.

CITY/TOWN
ARLINGTONB.I.N.
7XFBR. DEPT. NO.
A-10-015

8.-STRUCTURE NO.

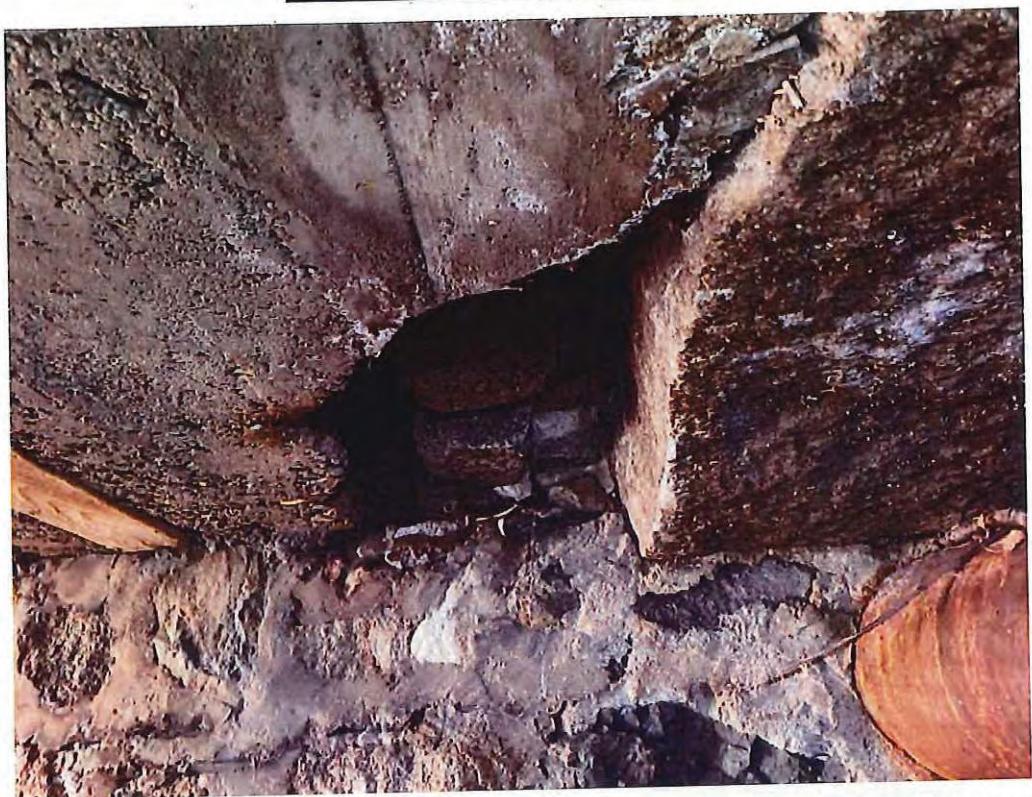
A10015-7XF-MUN-BRIINSPECTION DATE
JAN 24, 2020**PHOTOS**

Photo 7: Second concrete slab from the east: spall at the southwest corner exposing granite blocks and asphalt above.



Photo 8: Fifth granite slab from the east: full width hairline crack at midspan.

CITY/TOWN
ARLINGTONB.I.N.
7XFBR. DEPT. NO.
A-10-015

8.-STRUCTURE NO.

A10015-7XF-MUN-BRI

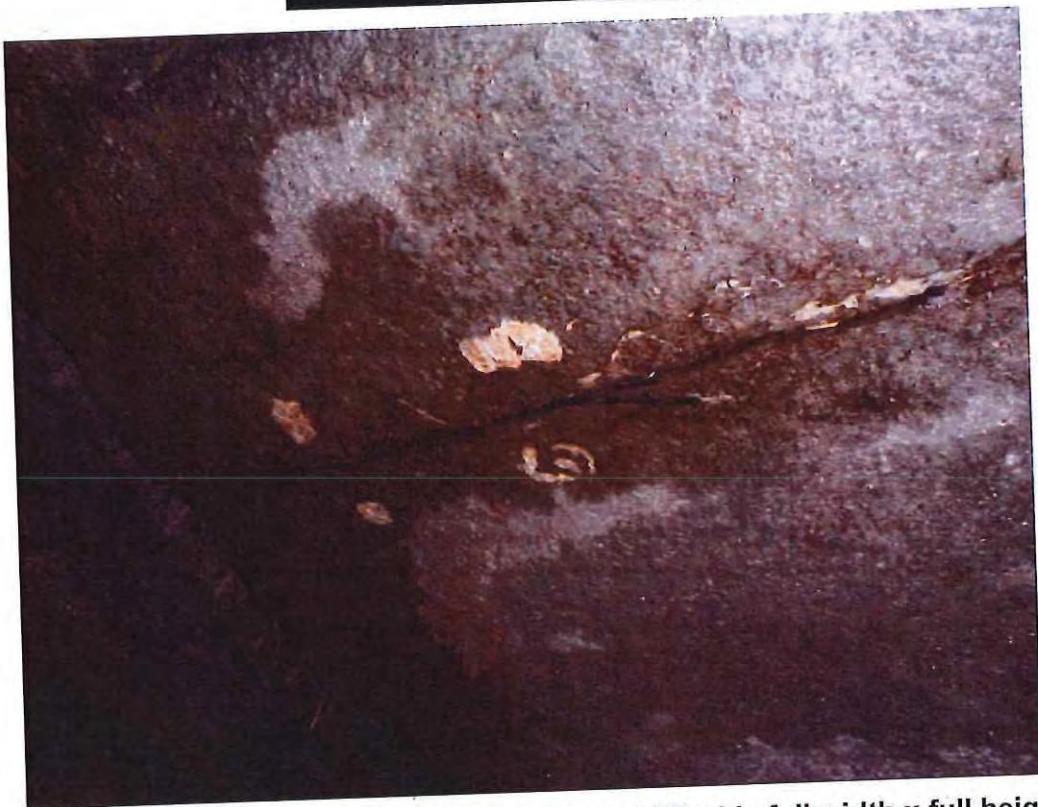
INSPECTION DATE
JAN 24, 2020**PHOTOS**

Photo 9: Seventh granite slab from the east: 1/4" wide full width x full height crack at midspan.



Photo 10: First concrete slab from the east: spall on the north east corner with exposed rebar.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 24, 2020
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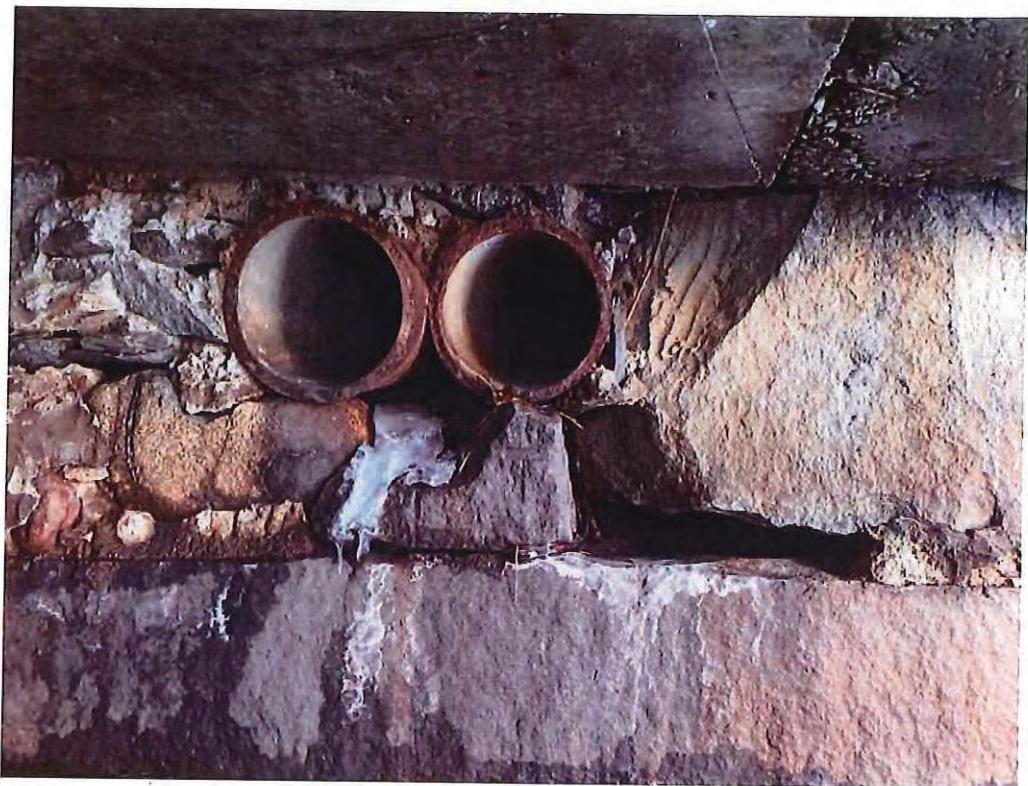
PHOTOS

Photo 11: South breastwall: southwest corner void below the drain pipe measuring 18" L x 10" H x 16" D.



Photo 12: South breastwall: at the east end there are loose stones with deteriorated masonry and mortar.

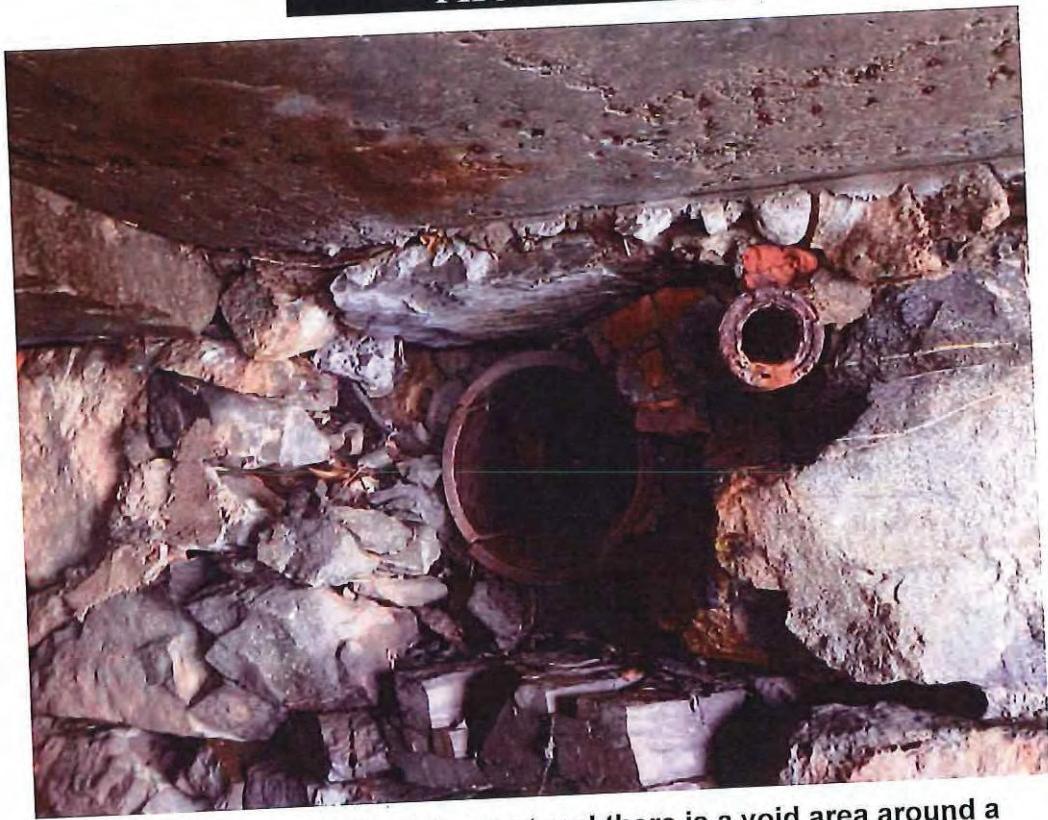
CITY/TOWN
ARLINGTONB.I.N.
7XFBR. DEPT. NO.
A-10-0158.-STRUCTURE NO.
A10015-7XF-MUN-BRIINSPECTION DATE
JAN 24, 2020**PHOTOS**

Photo 13: North breastwall: at the east end there is a void area around a drainage pipe measuring 2.5' L x 2' H x 2' D.



Photo 14: North breastwall: at the west end, there are voids above the 1st and 2nd course of blocks.



Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, Secretary & CEO
Jonathan L. Gulliver, Highway Administrator

RECEIVED
SHERIFF'S OFFICE
ARLINGTON MASS.
2017 OCT 19 PM 3:44



October 13, 2017

The Board of Selectmen
Town of Arlington
Town Hall
730 Massachusetts Avenue
Arlington, MA 02476

Attention: Wayne Chouinard, Town Engineer

SUBJECT: BRIDGE INSPECTION REPORT (NON-NBIS)

A-10-015 (7XF) US 3 Mystic Street / Mill Brook RSMI Dated: 01/17/17

Dear Members of the Board:

An inspection was performed on the referenced City/Town owned bridge. For your records, forwarded herewith is a copy of the bridge inspection report.

Repair, rehabilitation or reconstruction of any bridge to address the deficiencies reported is the owner/custodian's responsibility. Future Inspections are not the responsibility of Massachusetts Department of Transportation – Highway Division.

Questions regarding the content of this report may be directed to the District Bridge Inspection Engineer, Thomas Weil, P.E., at (781) 674-2172.

Sincerely,

Paul D. Stedman
for Paul D. Stedman,
District Highway Director

DJC / TW / cab
cc: Brian Clang-BIE, D-4 DHD, D-4 DBIE
Enclosures

REPORT D
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 18
STRUCTURES INSPECTION FIELD REPORT

2-DIST
04B.I.N.
7XFBR. DEPT. NO.
A-10-015**ROUTINE & SPECIAL MEMBER INSPECTION**

CITY/TOWN ARLINGTON	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	11-KILO. POINT 000.000	41-STATUS A:OPEN	90-ROUTINE INSP. DATE JAN 17, 2017
07-FACILITY CARRIED US 3 MYSTIC ST	MEMORIAL NAME/LOCAL NAME	27-YR BUILT 1850	106-YR REBUILT 1958	YR REHAB'D (NON 106) 0000
06-FEATURES INTERSECTED WATER MILL BROOK	26-FUNCTIONAL CLASS Urban Arterial	DIST. BRIDGE INSPECTION ENGINEER <i>T. G. Weil</i>		
43-STRUCTURE TYPE 801 : Masonry Slab	22-OWNER Town Agency	21-MAINTAINER Town Agency	TEAM LEADER J. Dideo <i>J. Dideo</i>	
107-DECK TYPE 9 : Other	WEATHER Cloudy	TEMP. (air) -7°C	TEAM MEMBERS D. SUAREZ, S. SHAW <i>S. Shaw</i>	

ITEM 58		3	DEF		ITEM 59		3	DEF		ITEM 60		4	DEF			
DECK					SUPERSTRUCTURE					SUBSTRUCTURE						
1.Wearing surface	5	S-P			1.Stringers		N	-	1. Abutments		Dive	Cur	4			
2.Deck Condition	3	S-A			2.Floorbeams		N	-	a. Pedestals	N	N					
3.Stay in place forms	N	-			3.Floor System Bracing		N	-	b. Bridge Seats	N	H					
4.Curbs	7	-			4.Girders or Beams		3	S-A	c. Backwalls	N	H					
5.Median	N	-			5.Trusses - General		N	-	d. Breastwalls	N	4			S-A		
6.Sidewalks	5	S-A			a. Upper Chords	N	-	e. Wingwalls	N	6						
7.Parapets	N	-			b. Lower Chords	N	-	f. Slope Paving/Rip-Rap	N	N						
8.Railing	4	S-A			c. Web Members	N	-	g. Pointing	N	6			M-P			
9.Anti Missile Fence	N	-			d. Lateral Bracing	N	-	h. Footings	N	H						
10.Drainage System	6	M-P			e. Sway Bracings	N	-	i. Piles	N	N						
11.Lighting Standards	N	-			f. Portals	N	-	j. Scour	N	7						
12.Utilities	7	-			g. End Posts	N	-	k. Settlement	N	7						
13.Deck Joints	N	-			6.Pin & Hangers	N	-	l. Curtain Wall	N	5						
14.	N	-			7.Conn Plt's, Gussets & Angles	N	-	m.Pier Cap Support	N	6				M-P		
15.	N	-			8.Cover Plates	N	-									
16.	N	-			9.Bearing Devices	N	-									
CURB REVEAL (In millimeters)		E	180	W	150			10.Diaphragms/Cross Frames	N	-						
APPROACHES		DEF			11.Rivets & Bolts	N	-									
a.Appr. pavement condition	7	-			12.Welds	N	-									
b.Appr. Roadway Settlement	7	-			13.Member Alignment	N	-									
c.Appr. Sidewalk Settlement	6	M-P			14.Paint/Coating	N	-									
d.	N	-			Year Painted	N	-									
OVERHEAD SIGNS (Y/N) (Attached to bridge)		N	DEF			COLLISION DAMAGE: Please explain			3. Pile Bents	N						
a. Condition of Welds	N	-			None (X) Minor () Moderate () Severe ()			a. Pile Caps	N	N						
b. Condition of Bolts	N	-			LOAD DEFLECTION: Please explain			b. Piles	N	N						
c. Condition of Signs	N	-			None (X) Minor () Moderate () Severe ()			c. Diagonal Bracing	N	N						
						LOAD VIBRATION: Please explain			d. Horizontal Bracing	N	N					
						None (X) Minor () Moderate () Severe ()			e. Fasteners	N	N					
						Any Fracture Critical Member: (Y/N)	N		UNDERMINING (Y/N) If YES please explain	N						
						Any Cracks: (Y/N)	N		COLLISION DAMAGE:							
								None () Minor () Moderate () Severe ()								
								None () Minor () Moderate (X) Severe ()								
								SCOUR: Please explain								
								None () Minor () Moderate (X) Severe ()								
								I-60 (Dive Report): N			I-60 (This Report): 4					
								93B-U/W (DIVE) Insp			00/00/0000					

X=UNKNOWN

N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE

R=REMOVED

CITY/TOWN ARLINGTON			B.I.N. 7XF	BR. DEPT. NO. A-10-015	8-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 17, 2017
ITEM 61 <i>CHANNEL & CHANNEL PROTECTION</i>			5	ITEM 36 TRAFFIC SAFETY		ACCESSIBILITY (Y/N/P)
				36 COND	DEF	Needed Used
				A. Bridge Railing 0 4 S-A	B. Transitions 0 0 S-A	Lift Bucket N N
				C. Approach Guardrail 0 0 S-A	D. Approach Guardrail Ends 0 0 S-A	Ladder N N
				WEIGHT POSTING Not Applicable X		Boat N N
				Actual Posting H 3 3S2 Single	N N N N	Waders Y Y
				Recommended Posting	N N N N	Inspector 50 N N
				Waived Date: 00/00/0000 EJD/MT Date: 00/00/0000	Rigging N N	
				At bridge Other Advance		Staging N N
				Signs In Place (Y=Yes, N=No, NR=Not Required) N S N S	Traffic Control N N	
				Legibility/Visibility N S N S	RR Flagger N N	
				CLEARANCE POSTING		Police N N
				Not X ft in meter	At bridge E W ft in	Other: N N
				Actual Field Measurement	0 0 0 0	
				Posted Clearance	0 0 0 0	
				Signs In Place (Y=Yes, N=No, NR=Not Required) E W E W	TOTAL HOURS 12	
				Legibility/Visibility E W E W	PLANS (Y/N): Y	
ITEM 61 (Dive Report): <input type="checkbox"/> ITEM 61 (This Report): 5			93b-U/W INSP. DATE: 00/00/0000	(V.C.R.) (Y/N): N		TAPE#:
STREAM FLOW VELOCITY: Tidal () High () Moderate () Low (X) None ()				List of field tests performed:		
RATING Rating Report (Y/N): N			(To be filled out by DBIE) Request for Rating or Rerating (Y/N): N	If YES please give priority: HIGH () MEDIUM () LOW ()		
Date: 00/00/0000 Inspection data at time of existing rating 158: - 159: - 160: - Date: 00/00/0000			REASON: TW			
CONDITION RATING GUIDE						(For Items 58, 59, 60 and 61)
	CODE	CONDITION	DEFECTS			
	N	NOT APPLICABLE				
G	9	EXCELLENT	Excellent condition.			
G	8	VERY GOOD	No problem noted.			
G	7	GOOD	Some minor problems.			
F	6	SATISFACTORY	Structural elements show some minor deterioration.			
F	5	FAIR	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.			
P	4	POOR	Advanced section loss, deterioration, spalling or scour.			
P	3	SERIOUS	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.			
C	2	CRITICAL	Advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.			
C	1	"IMMINENT" FAILURE	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put it back in light service.			
	0	FAILED	Out of service - beyond corrective action.			
DEFICIENCY REPORTING GUIDE						
DEFICIENCY: A defect in a structure that requires corrective action.						
CATEGORIES OF DEFICIENCIES:						
M= Minor Deficiency - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion of steel, Minor scouring, Clogged drainage, etc.						
S= Severe/Major Deficiency - Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroded rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.						
C-S= Critical Structural Deficiency - A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.						
C-H= Critical Hazard Deficiency - A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.						
URGENCY OF REPAIR:						
I = Immediate- [Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the Deficiency and to receive further instruction from him/her].						
A = ASAP- [Action/Repair should be initiated by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) upon receipt of the Inspection Report].						
P = Prioritize- [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].						

2-DIST

B.I.N.

04

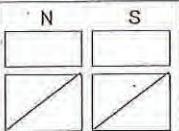
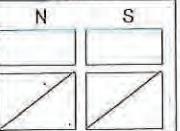
7XF

STRUCTURES INSPECTION FIELD REPORT

ROUTINE & SPECIAL MEMBER INSPECTION

BR. DEPT. NO.

A-10-015

CITY/TOWN ARLINGTON	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	11-KILO. POINT 000.000	90-ROUTINE INSP. DATE Jan 17, 2017	93*-SPEC. MEMB. INSP. DATE Jan 17, 2017
07-FACILITY CARRIED US 3 MYSTIC ST	MEMORIAL NAME/LOCAL NAME	27-YR BUILT 1850	106-YR REBUILT 1958	*YR REHAB'D (NON 106) 0000
06-FEATURES INTERSECTED WATER MILL BROOK	26-FUNCTIONAL CLASS Urban Arterial	DIST. BRIDGE INSPECTION ENGINEER T. G. Weil		
43-STRUCTURE TYPE 801 : Masonry Slab	22-OWNER Town Agency	21-MAINTAINER Town Agency	TEAM LEADER J. Dideo <i>Joseph Dideo</i>	
107-DECK TYPE 9 : Other	WEATHER Cloudy	TEMP. (air) -7°C	TEAM MEMBERS D. SUAREZ, S. SHAW	<i>SJ SS</i>
WEIGHT POSTING	<i>Not Applicable</i>		X	
Actual Posting	H <input type="checkbox"/> N	3 <input type="checkbox"/> N	3S2 <input type="checkbox"/> N	Single <input type="checkbox"/> N
Recommended Posting	<input type="checkbox"/> N	<input type="checkbox"/> N	<input type="checkbox"/> N	<input type="checkbox"/> N
Waived Date:	00/00/0000	EJDMT Date:	00/00/0000	
Signs In Place (Y=Yes, N=No, NR=Not Required) Legibility/Visibility				
At bridge  Advance 				
PLANS (Y/N): <input checked="" type="checkbox"/> Y (V.C.R.) (Y/N): <input type="checkbox"/> N TAPE#:				

RATING

Rating Report (Y/N): N

Date: _____

Request for Rating or Rerating (Y/N): N

If YES please give priority:

HIGH () MEDIUM () LOW ()

Inspection data at time of existing rating
158: - 159: - 160: - 162: - Date: 00/00/0000

REASON:

SPECIAL MEMBER(S):

	MEMBER	CRACK (Y/N):	WELD'S CONDITION (0-9)	LOCATION OF CORROSION, SECTION LOSS (%), CRACKS, COLLISION DAMAGE, STRESS CONCENTRATION, ETC.	CONDITION		INV. RATING OF MEMBER FROM RATING ANALYSIS			Deficiencies
					PREVIOUS	PRESENT	(0-9)	(0-9)	H-20	
					(0-9)	(0-9)			3	
A	Item 58.2 - Deck Condition	N		See remarks in comments section.	3	3			Not Rated	S-A
B	Item 59.4 - Girders or Beams	N		See remarks in comments section.	3	3			Not Rated	S-A
C	Item 60.1.d - Breastwalls	N		See remarks in comments section.	5	4			Not Rated	S-A
D										
E										

List of field tests performed:

I-58 I-59 I-60 I-62

(Overall Previous Condition)

 3 3 5 -

(Overall Current Condition)

 3 3 4 -

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion of steel, Minor scouring, Clogged drainage, etc.

S= Severe/Major Deficiency - Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroded rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.

C-S= Critical Structural Deficiency - A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

C-H= Critical Hazard Deficiency - A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.

URGENCY OF REPAIR:

I= Immediate (Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the deficiency and to receive further instruction from him/her).

A= ASAP- [Action/Repair should be initiated by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) upon receipt of the Inspection Report].

P= Prioritize- [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

X=UNKNOWN

N=NOT APPLICABLE

H=HIDDEN/INACCESSIBLE

R=REMOVED

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REMARKS

BRIDGE ORIENTATION

In accordance with the 1958 plans, the approaches and abutments are north and south and the elevations are east and west. There are two spans numbered from south to north. Mill Brook flows from west to east.

GENERAL REMARKS

The original structure was built prior to 1958 at an estimated date of 1850 using granite slabs. In 1958, the structure was widened by adding two reinforced concrete slabs (see Sketch 1 Labeled Span 1 and Span 2 Structural Composition) for approximate locations. Narrow steel I beam sections or possibly rail road tracks were added later. The abutments and pier are comprised of masonry walls.

The west sidewalk beam has extensive deterioration for the full length with exposed rebar. The west bridge railing posts are slightly undermined where they are bolted to this sidewalk beam.

Note: Since the last Routine Inspection, the void at the west end of the north breastwall in span 2 (previously measured to be 3' L x 7" H x 22" D) has grown in size to a length of 6' L x 8" H x 2' D. For this reason, Item 60 and Item 60.1.d is being lowered to a 4 S-A.

ITEM 58 - DECK

Item 58.1 - Wearing surface

There are several large bituminous patches with several light transverse, longitudinal, and map cracks throughout (**see photo 1**).

Also, the bituminous concrete wearing surface has several shallow potholes in the southbound breakdown lane, including one that is filled with water adjacent to the west curb measuring: 4' x 18" x 1.5" D (**see photos 2 and 3**).

Item 58.2 - Deck Condition

The deck consists of 10 granite slabs in the south span (span 1), and 11 slabs in the north span, (span 2). Because of two full width transverse cracks and one 2' long longitudinal crack found in three of the granite slabs in the north span, the deck is rated a '3'.

There is a reinforced concrete slab on the east and west side of the structure, where it was widened in 1958. Only the reinforced concrete concrete slabs will be discussed in item 58.2.

Span 1, West slab-Spalled full span x 24" wide x 3" D with some of the exposed rebar corroded and broken (**see photo 4**).

Span 1-Void just south of utility pipe, adjacent to the south abutment measuring: 18" x 18" x up to 10" Deep

Spans 1 and 2, East slab-Full length horizontal crack located 4" from bottom of slab and measures up to 1/4" wide (**see photo 5**).

Span 2, East slab, at the north abutment-Spall with rebar exposed measuring: 2' L x 1' W x 2" D. (**see photo 6**).

Item 58.6 - Sidewalks

The west sidewalk was paved over with an additional 2" of bituminous concrete, full length x full width (**see photo 7, typical**).

East sidewalk-Several random hairline transverse cracks throughout.

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REMARKS

Item 58.8 - Railing

Metal Bridge Railing Type H on both sides of the structure.

Bridge railing post 4 is undermined where it attaches to the west sidewalk beam (**see photo 8**). Posts 2 and 3 out of 5 posts are also partially undermined (**see photo 9**).

At the west bridge railing in panel 1, there is Collision damage to the 8th pale and the 9th pale is missing (**see photo 10**).

Item 58.10 - Drainage System

There are several missing chinking stones located at the outlet of each of the drainage pipes that discharge storm water into the brook (**see photos 11 and 12**).

APPROACHES

Approaches c - Appr. Sidewalk Settlement

There is up to 2" settlement located at the northeast approach sidewalk.

ITEM 59 - SUPERSTRUCTURE

Item 59.4 - Girders or Beams

The reinforced concrete slab is part of the superstructure because it supports itself and is discussed previously in section 58.2.

The granite slabs act as girders and are listed in this section.

Lastly, there are 4 narrow steel beams in each span that are not included in the 1958 plans, and are believed to have been installed at some point after the structure was widened. Only the bottom flanges of these beams are visible and there is only minor rust on the bottom flanges. The beams have a 5-1/2" wide bottom flange and are placed abutting one another so only the bottom face of the bottom flange is visible.

In Span 1, the 1st granite beam from the east has a hairline crack at mid span of beam, below the utility pipe.

Span 2, 5th granite slab from the east (25' from the east end of structure)-Full width hairline crack at midspan, could not tell if the crack was full height (**see photo 13**).

Span 2, 7th granite slab from the east (30' from the east end of structure) -1/4" wide full width x full height crack at midspan (**see photo 14**).

Span 2, 1st granite slab from the west (52' from the east end/ 15' from the west end of structure)- 2' long longitudinal hairline crack adjacent to the north breastwall (**see photo 15**).

East sidewalk Beam-Hairline cracking on bottom face with rust staining in spans 1 and 2 (**see photo 5**).

West Sidewalk Beam-Heavily Spalled at the top corner measuring: Full length x up to 20" H x up to 8" D (**see photos 8 and 9**).

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REMARKS**ITEM 60 - SUBSTRUCTURE****Item 60.1 - Abutments****Item 60.1.d - Breastwalls**

There are several missing chinking stones/ pointing throughout both breastwalls, particularly around the drain pipes.

South breastwall between drainage pipes-missing chinking stones. Void below west drain pipe measuring: 18" L X 10" H X 16" D.

North breastwall, 5' from the east end-Voids around utility pipe (see photo 12).

****Note: Since the last Routine Inspection, the void that was previously measured to be 3' L x 7" H x 22" D in span 2 above the 1st course of blocks has now grown in size to a length of 6' L x 8" H x 2' D. For this reason, Item 60 and 60.1.d is being lowered to a 4 S-A (see photos 16 and 17).**

Item 60.1.g - Pointing

There are several areas throughout the abutments and the pier that are missing pointing between stones.

Item 60.1.l - Curtain Wall

There are several random hairline cracks throughout the curtain walls.

Item 60.1.m - Pier Cap Support

West sidewalk support, south face, bottom corner - Spall measuring: 25" L x 4" H x 4" D (see photo 18).

Item 60.2 - Piers or Bents**Item 60.2.d - Stems/Webs/Pierwalls**

Granite block pier, void measuring 22' from the west end measuring 1' W x 14" H x full depth penetration (see photo 19).

Item 60.2.e - Pointing

There are several areas throughout the pier that could use pointing.

SubStructure Scour Notes

There is moderate scour at the upstream end of the structure in span 2, adjacent to the north breast wall.

ITEM 61 - CHANNEL AND CHANNEL PROTECTION**Item 61.2 - Embankment Erosion**

There is considerable erosion located at the southwest embankment causing the flow in span 1 to be restricted (see photo 20).

Item 61.3 - Debris

The majority of the debris has been removed from the upstream end since the last inspection.

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REMARKS**Item 61.7 - Aggradation**

There is a considerable amount of aggradation at the upstream end of the channel partially restricting flow in span 1 (see photo 20).

TRAFFIC SAFETY**Item 36a - Bridge Railing**

See Item 58.8

Item 36b - Transitions

Transitions do not exist.

Item 36c - Approach Guardrail

Approach guardrail does not exist.

Item 36d - Approach Guardrail Ends

Approach guardrail ends do not exist.

Sketch / Photo Log

Sketch 1 : SPAN 1 AND SPAN 2 STRUCTURAL COMPOSITION

Photo 1 : Bituminous wearing surface-Numerous cracks, patches, wheel rutting in both travel lanes, and areas of minor settlement.

Photo 2 : Southbound roadway-Pothole adjacent to the west curb measuring: 4' L x 18" W x 1-1/2" D.

Photo 3 : Southbound roadway-Pothole adjacent to the west curb measuring: 4' L x 18" W x 1-1/2" D.

Photo 4 : Span 1, west sidewalk slab-Spall measuring: Full length x 24" wide x 3" D.

Photo 5 : Span 1 and 2-East slab, full.length longitudinal crack located 4" from the bottom face.

Photo 6 : Span 2, east concrete slab at the north abutment has a spall with exposed rebar measuring: 2' L x 1' W x 2" D.

Photo 7 : West sidewalk-Additional 2" thick x full width x full length of bituminous added since the last routine inspection

Photo 8 : West sidewalk beam is partially undermining railing post 4 (typical at posts 2 and 3).

Photo 9 : West sidewalk beam-Severe spalling with railing posts 2, 3, and 4 of 5 partially undermined.

Photo 10 : West bridge railing panel 1-Collision damage to the 8th pale/ Missing 9th pale:

Photo 11 : Span 1, south pipe-Several missing chinking stones.

Photo 12 : Span 2, north breastwall, 5' from the east end-Numerous voids around utility pipe.

Photo 13 : Span 2, granite clapper #5 from the east end -Full width hairline transverse crack.

Photo 14 : Span 2, granite clapper #7 from the east end-Full width crack x 1/4" Long (photo shown with broken crack gauge).

Photo 15 : Span 2, 1st granite clapper, from the west end-2' Long hairline longitudinal crack starting at the north abutment.

Photo 16 : Span 2, large void/ washout above the top course of blocks measuring: 6' L x 8" H x 2' D.

Photo 17 : Span 2, large void/ washout above the top course of blocks measuring: 6' L x 8" H x 2' D.

Photo 18 : West sidewalk support, south face, bottom corner-Spall measuring: 25" L x 4" H x 4" D.

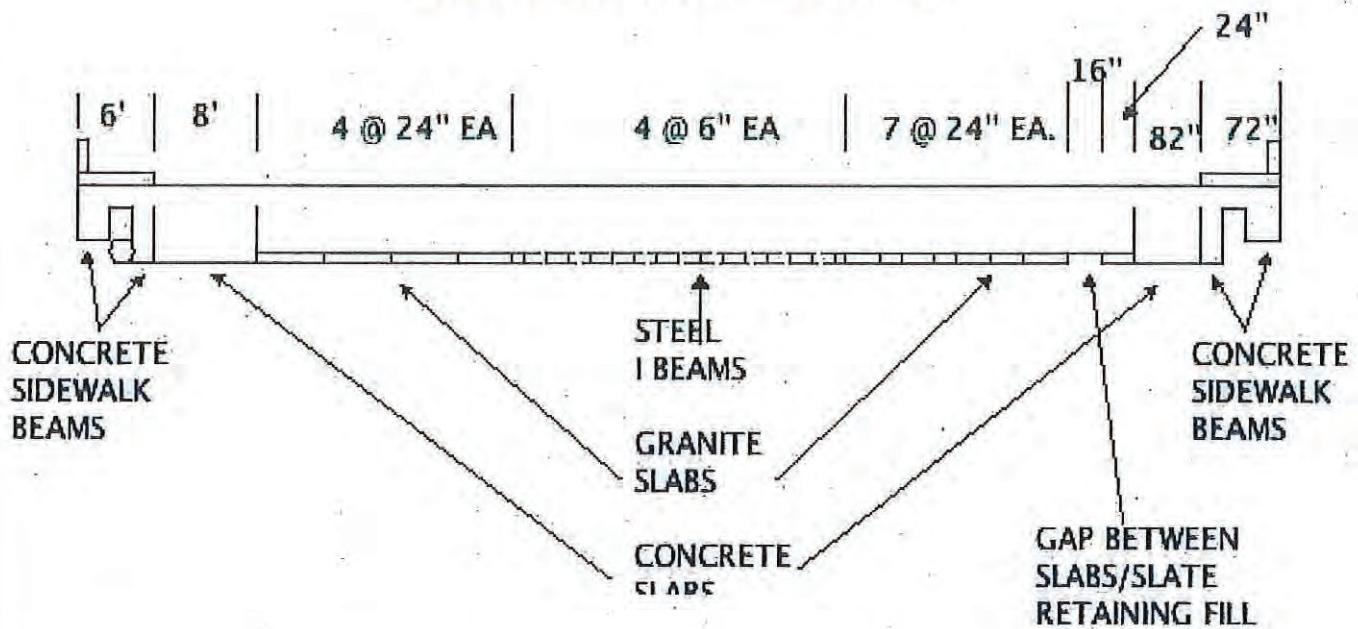
Photo 19 : Granite block pier, void measuring 22' from the west end measuring 1' W x 14" H x full depth penetration.

Photo 20 : Upstream end of Brook showing heavy aggradation, embankment erosion, and restricted flow to the south span (span 1).

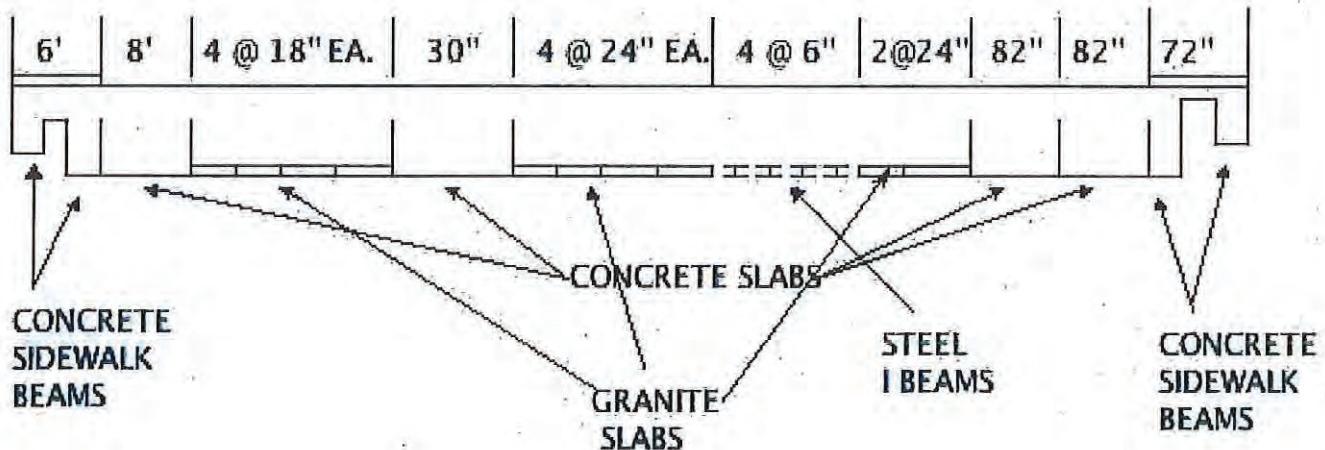
CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 17, 2017
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SKETCHES

SPAN 2 NORTH SPAN LOOKING NORTH



SPAN 1 SOUTH SPAN LOOKING NORTH



Sketch 1: SPAN 1 AND SPAN 2 STRUCTURAL COMPOSITION

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PHOTOS

Photo 1: Bituminous wearing surface-Numerous cracks, patches, wheel rutting in both travel lanes, and areas of minor settlement.



Photo 2: Southbound roadway-Pothole adjacent to the west curb measuring:
4' L x 18" W x 1-1/2" D.

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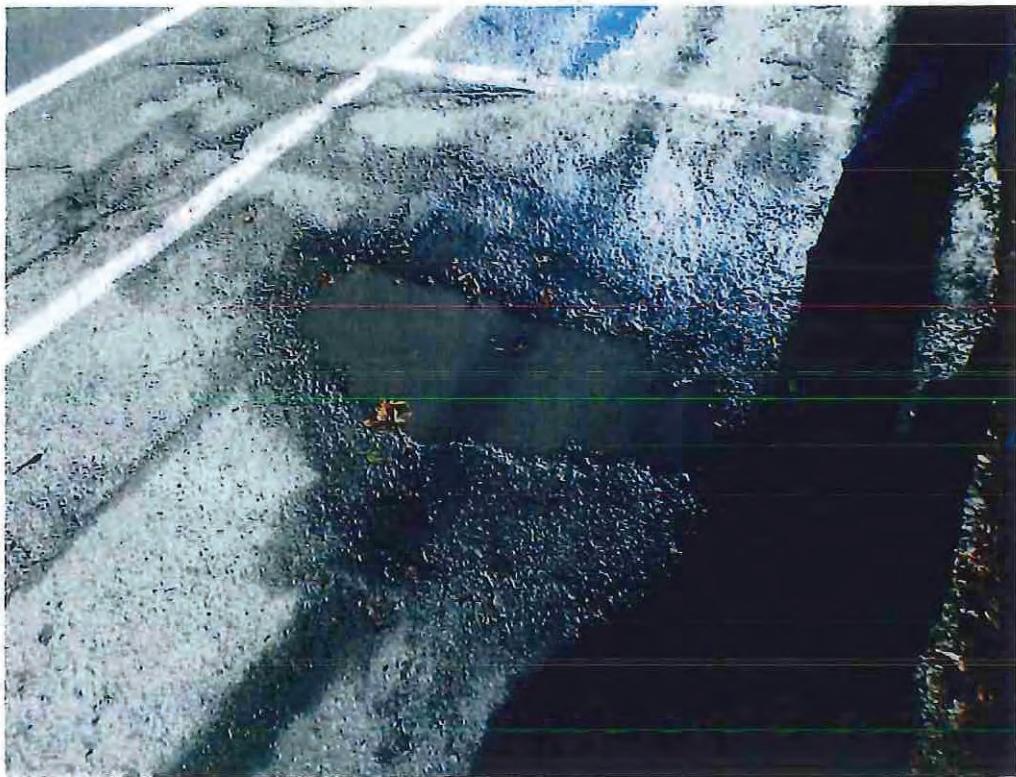
PHOTOS

Photo 3: Southbound roadway-Pothole adjacent to the west curb measuring:
4' L x 18" W x 1-1/2" D.



Photo 4: Span 1, west sidewalk slab-Spall measuring: Full length x 24" wide x
3" D.

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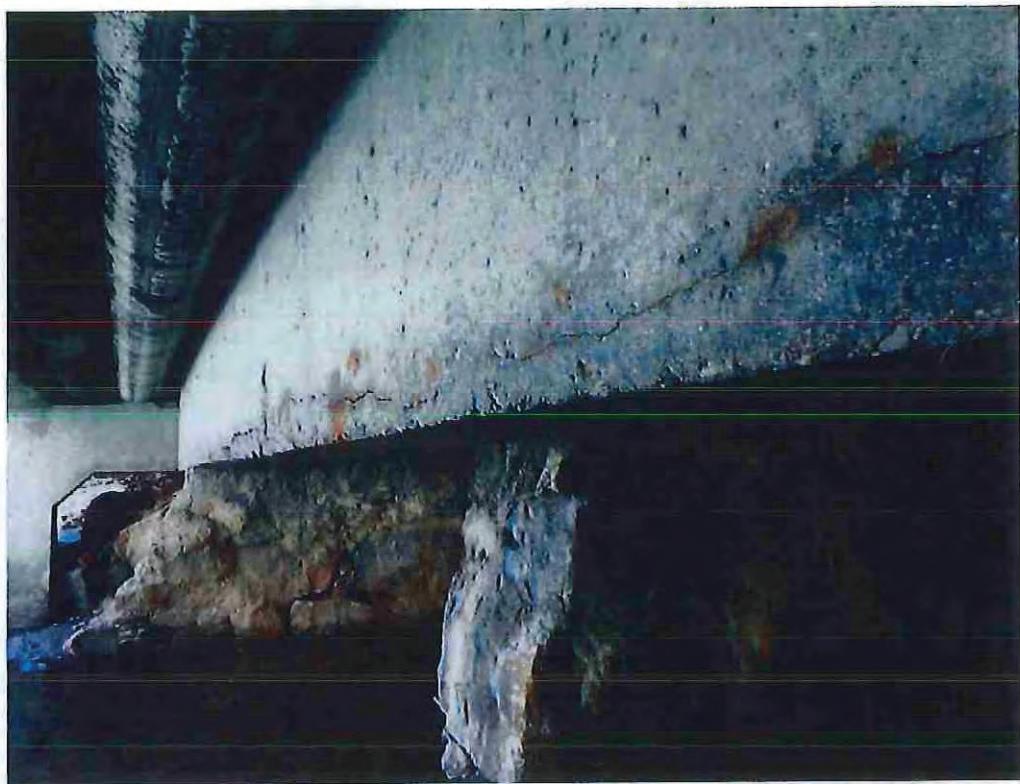
PHOTOS

Photo 5: Span 1 and 2-East slab, full length longitudinal crack located 4" from the bottom face.



Photo 6: Span 2, east concrete slab at the north abutment has a spall with exposed rebar measuring: 2' L x 1' W x 2" D.

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PHOTOS

Photo 7: West sidewalk-Additional 2" thick x full width x full length of bituminous added since the last routine inspection



Photo 8: West sidewalk beam is partially undermining railing post 4 (typical at posts 2 and 3).

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PHOTOS

Photo 9: West sidewalk beam-Severe spalling with railing posts 2, 3, and 4 of 5 partially undermined.



Photo 10: West bridge railing panel 1-Collision damage to the 8th pale/ Missing 9th pale.

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PHOTOS

Photo 11: Span 1, south pipe-Several missing chinking stones.



Photo 12: Span 2, north breastwall, 5' from the east end-Numerous voids around utility pipe.

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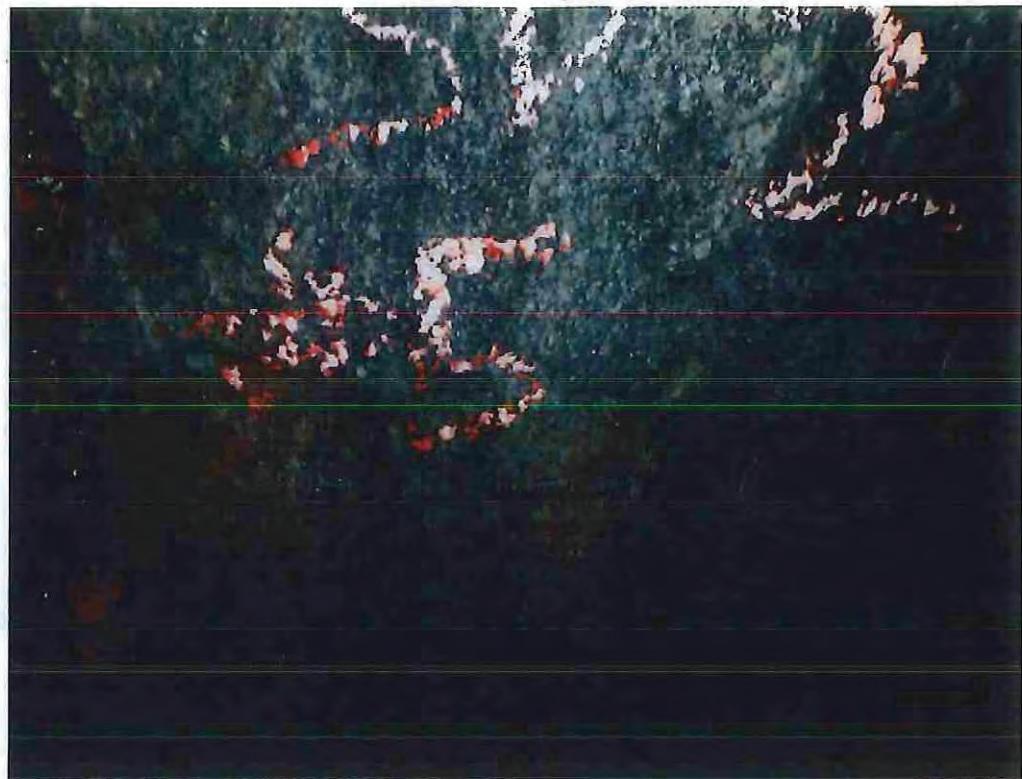
PHOTOS

Photo 13: Span 2, granite clapper #5 from the east end -Full width hairline transverse crack.



Photo 14: Span 2, granite clapper #7 from the east end-Full width crack x 1/4" Long (photo shown with broken crack gauge).

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 17, 2017
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PHOTOS

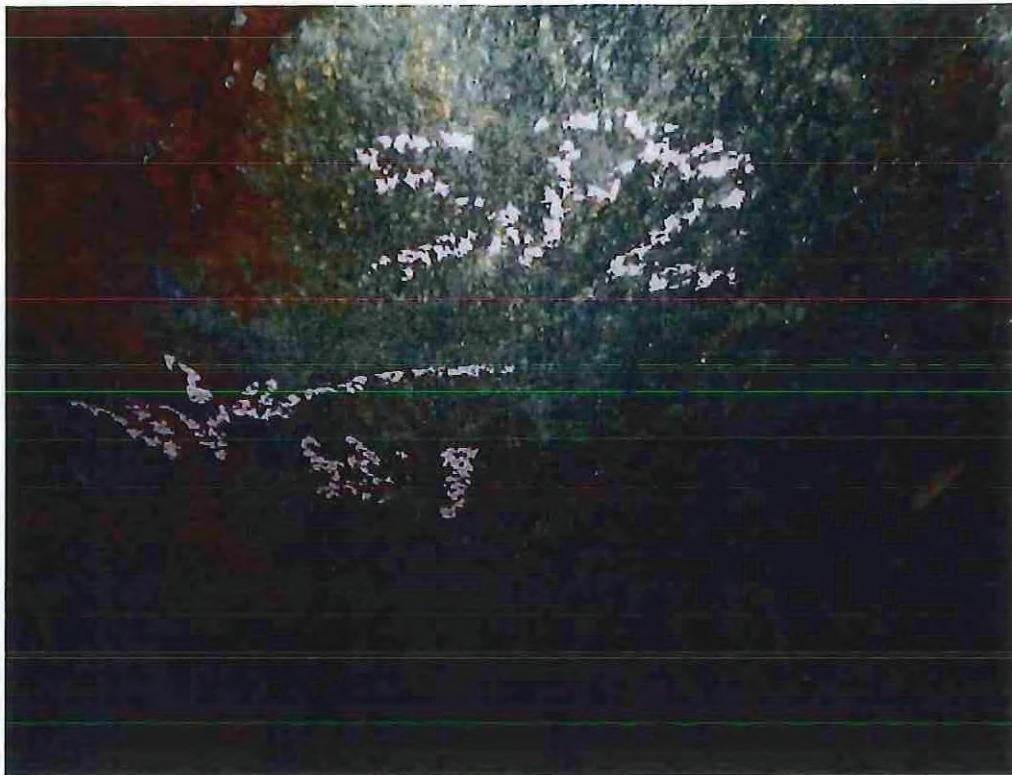


Photo 15: Span 2, 1st granite clapper, from the west end-2' Long hairline longitudinal crack starting at the north abutment.



Photo 16: Span 2, large void/ washout above the top course of blocks measuring: 6' L x 8" H x 2' D.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 17, 2017
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PHOTOS

Photo 17: Span 2, large void/ washout above the top course of blocks
measuring: 6' L x 8" H x 2' D.



Photo 18: West sidewalk support, south face, bottom corner-Spall measuring:
25" L x 4" H x 4" D.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 17, 2017
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PHOTOS

Photo 19: Granite block pier, void measuring 22' from the west end measuring 1' W x 14" H x full depth penetration.



Photo 20: Upstream end of Brook showing heavy aggradation, embankment erosion, and restricted flow to the south span (span 1).

REPORT C

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 8

2-DIST

B.I.N.

04

7XF

STRUCTURES INSPECTION FIELD REPORT

SPECIAL MEMBER INSPECTION

BR. DEPT. NO.

A-10-015

CITY/TOWN ARLINGTON	8-STRUCTURE NO. A10015-7XF-MUN-BRI	11-KILO. POINT 000.000	90-ROUTINE INSP. DATE Jan 21, 2015	93-SPEC. MEMB. INSP. DATE Feb 29, 2016	
07-FACILITY CARRIED US 3 MYSTIC ST	MEMORIAL NAME/LOCAL NAME	27-YR BUILT 1850	106-YR REBUILT 1958	*YR REHAB'D (NON 106) 0000	
06-FEATURES INTERSECTED WATER MILL BROOK	26-FUNCTIONAL CLASS Urban Arterial	DIST. BRIDGE INSPECTION ENGINEER T. G. Well			
43-STRUCTURE TYPE 801 : Masonry Slab	22-OWNER Town Agency	21-MAINTAINER Town Agency	TEAM LEADER J. Dideo		
107-DECK TYPE 9 : Other	WEATHER Clear	TEMP. (air) 16°C	TEAM MEMBERS A. MARLIN		
WEIGHT POSTING	Not Applicable	X	At bridge	Advance	PLANS (Y/N): Y
Actual Posting	H N	3 N	3S2 N	Single N	Signs In Place (Y=Yes, N=No, NR=Not Required)
Recommended Posting	N	N	N	N	Legibility/Visibility
Waived Date:	00/00/00	EJDMT Date:	00/00/00		(V.C.R.) (Y/N): N
					TAPE#:

RATING

Rating Report (Y/N): **N**Date: **---**Request for Rating or Rerating (Y/N): **N**

If YES please give priority:

HIGH () MEDIUM () LOW ()

REASON:

Inspection data at time of existing rating
I 58: - I 59: - I 60: - I 62: - Date: 00/00/00

SPECIAL MEMBER(S):

	MEMBER	CRACK (Y/N):	WELD'S CONDITION (0-9)	LOCATION OF CORROSION, SECTION LOSS (%), CRACKS, COLLISION DAMAGE, STRESS CONCENTRATION, ETC.	CONDITION		INV. RATING OF MEMBER FROM RATING ANALYSIS			Deficiencies
					PREVIOUS (0-9)	PRESNT (0-9)	H-20	3	3S2	
A	Item 58.2 - Deck Condition	N	N	See remarks in comments section.	3	3	Not Rated		S-A	
B	Item 59.4 - Girders or Beams	N	N	See remarks in comments section.	3	3	Not Rated		S-A	
C										
D										
E										

List of field tests performed:

HANDS ON INSPECTION

I-58 I-59 I-60 I-62

(Overall Previous Condition)

3 3 5 -

(Overall Current Condition)

3 3 5 -

DEFICIENCY: A defect in a structure that requires corrective action.**CATEGORIES OF DEFICIENCIES:****M= Minor Deficiency** - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion of steel, Minor scouring, Clogged drainage, etc.**S= Severe/Major Deficiency** - Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroded rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.**C-S= Critical Structural Deficiency** - A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.**C-H= Critical Hazard Deficiency** - A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.**URGENCY OF REPAIR:****I = Immediate-** [Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the deficiency and to receive further instruction from him/her].**A = ASAP-** [Action/Repair should be initiated by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) upon receipt of the inspection report].**P = Prioritize-** [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

X=UNKNOWN

N=NOT APPLICABLE

H=HIDDEN/INACCESSIBLE

R=REMOVED

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE FEB 29, 2016
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REMARKS

BRIDGE ORIENTATION

In accordance with the 1958 plans, the approaches and abutments are north and south and the elevations are east and west. There are two spans numbered from south to north. Mill Brook flows from west to east.

GENERAL REMARKS

The original structure was built prior to 1958 at an estimated date of 1850 using granite slabs. In 1958, the structure was widened by adding two reinforced concrete slabs (see Sketch 1 labeled Span 1 and Span 2 Structural composition) for approximate locations. Narrow steel I beam sections or possibly rail road tracks were added later. The abutments and pier are comprised of masonry walls.

The west sidewalk beam has extensive deterioration for the full length with exposed rebar. The west bridge railing posts are slightly undermined where they are bolted to this sidewalk beam.

ITEM 58 - DECK

Item 58.2 - Deck Condition

The deck consists of 10 granite slabs in the south span (span 1), and 12 slabs in the north span, (span 2). Because of a full width transverse crack found in two of the granite slabs and one 2' long longitudinal crack found in one of the granite slabs in the north span, the deck is rated a '3'.

Refer to Item 59.4 for deficiencies related to the granite slabs in the north span (span 2).

ITEM 59 - SUPERSTRUCTURE

Item 59.4 - Girders or Beams

The granite slabs act as girders and are listed in this section.

There are 4 narrow steel beams in the south span and 14 beams in the north span that are not included in the 1958 plans, and are believed to have been installed at some point after the structure was widened. Only the bottom flanges of these beams are visible and there is only minor rust on the bottom flanges. The beams have a 5-1/2" wide bottom flange and are placed abutting one another so only the bottom face of the bottom flange is visible.

In Span 2, the fifth granite slab from the east (25' from the east end of structure) has a full width hairline crack at midspan. During inspection, it could not be determined if the crack was full height due to the adjacent slabs being in such close proximity to the slab being examined. There were no changes noted since the last Special Member inspection (see photo 1).

In Span 2, the seventh granite slab from the east (30' from the east end of structure) has a 1/4" wide full width x full height crack at midspan. Note: A crack gage was installed both on the underside of this slab and on the east face to determine if the crack is getting any larger. There were no changes noted since the last Special Member inspection (see photos 2 through 4). The blue masking tape shown in the photos is only a temporary support for the two crack gages, while the epoxy bonding the gages to the slab cures.

In Span 2, the first granite slab from the west (15' from the west end of structure)- 2' long longitudinal hairline crack adjacent to the north breastwall (see photo 5 and 6).

The West Sidewalk Beam is heavily Spalled at the top corner measuring: Full length x up to 20" H x up to 8" D (see photo 7).

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE FEB 29, 2016
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REMARKS

Sketch / Photo Log

- Sketch 1 : Span 1 and Span 2 Structural Composition
- Photo 1 : Span 2-5th Granite slab from the east end has a hairline transverse crack at mid-span.
- Photo 2 : Span 2, 7th granite slab from the east-Full width 1/4" wide transverse crack. Note that a crack gage was installed on the bottom face of the slab at mid-span.
- Photo 3 : Span 2, 7th granite slab from the east end-Full height vertical crack. Note that a crack gage was installed on the east face of the slab.
- Photo 4 : Span 2, 7th granite slab from the east end-Full height vertical crack. Note that a crack gage was installed on the east face of the slab.
- Photo 5 : Span 2, 1st block from the west-24" Longitudinal hairline crack in the (No change since last Special Member Inspection).
- Photo 6 : Span 2-1 block from the westst 24" Longitudinal hairline crack in the (No change noted since last Special Member Inspection).
- Photo 7 : West Sidewalk Beam-Severe Spalling throughout.

CITY/TOWN
ARLINGTONB.I.N.
7XFBR. DEPT. NO.
A-10-015

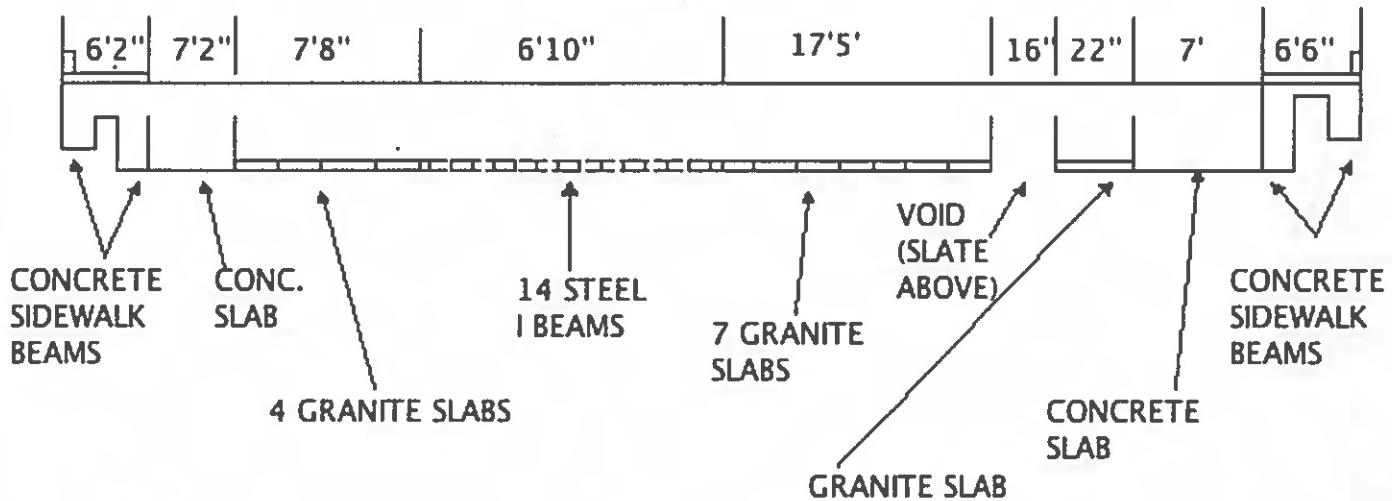
8-STRUCTURE NO.

A10015-7XF-MUN-BRI

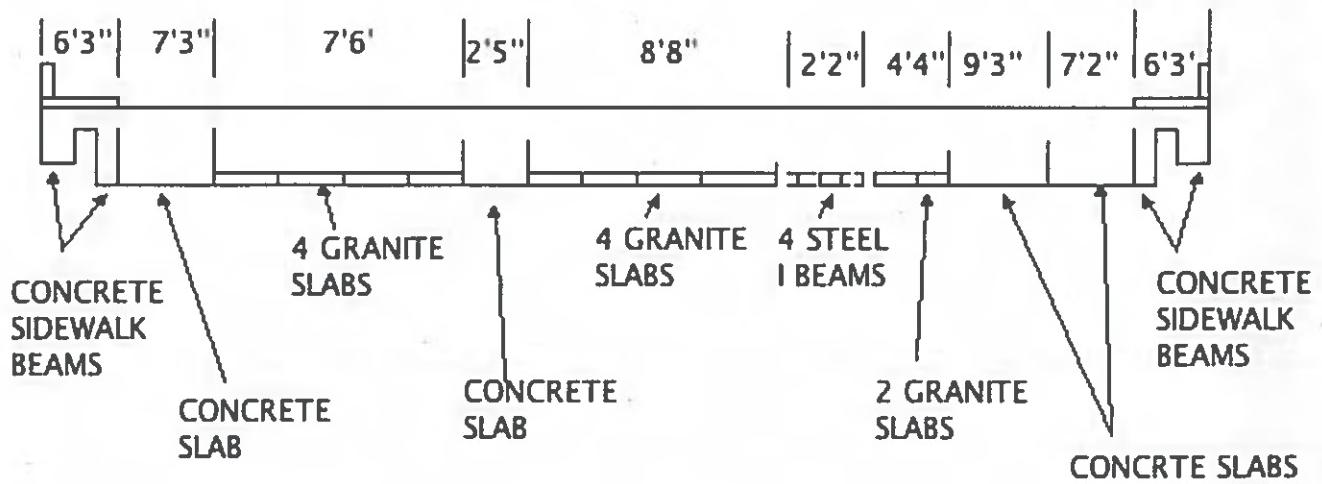
INSPECTION DATE
FEB 29, 2016

SKETCHES

SPAN 2 NORTH SPAN LOOKING NORTH



SPAN 1 SOUTH SPAN LOOKING NORTH



Sketch 1: Span 1 and Span 2 Structural Composition

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8. STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE FEB 29, 2016
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PHOTOS



Photo 1: Span 2-5th Granite slab from the east end has a hairline transverse crack at mid-span.



Photo 2: Span 2, 7th granite slab from the east-Full width 1/4" wide transverse crack. Note that a crack gage was installed on the bottom face of the slab at mid-span.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE FEB 29, 2016
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PHOTOS



Photo 3: Span 2, 7th granite slab from the east end-Full height vertical crack.
Note that a crack gage was installed on the east face of the slab.



Photo 4: Span 2, 7th granite slab from the east end-Full height vertical crack.
Note that a crack gage was installed on the east face of the slab.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE FEB 29, 2016
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PHOTOS



Photo 5: Span 2, 1st block from the west-24" Longitudinal hairline crack in the (No change since last Special Member Inspection).



Photo 6: Span 2-1 block from the westst 24" Longitudinal hairline crack in the (No change noted since last Special Member Inspection).

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE FEB 29, 2016
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PHOTOS



Photo 7: West Sidewalk Beam-Severe Spalling throughout.

Pontis BMS Element Inspection

BDEPT#	A-10-015	Date	01/21/2015
B.I.N.	7XF	District Bridge Inspection Eng'r	Thomas G. Weil
Item 8	A10015-7XF-MUN-BRI	Inspecting Agency	Mass. Highway Dept.
Span Group	1	Team Leader	Joseph Dideo
Town	Arlington	Team Member(s)	Pradip N. Shah
District	4		

El #	Element Name	Units	Env.	Total Q.	% or Q	State 1	State 2	State 3	State 4	State 5
2	Sidewalk, Concrete, No Overlay, Unprotected	EA/SF	2	213.1	<input checked="" type="checkbox"/> %	0.0 %	100.0 %	0.0 %	0.0 %	0.0 %
4	Sidewalk, Concrete, AC Overlay, Protected	EA/SF	2	193.8	<input checked="" type="checkbox"/> %	0.0 %	0.0 %	0.0 %	0.0 %	100.0 %
211	Pier Wall, Other Materials	LF	2	60.9	<input checked="" type="checkbox"/> %	0.0 %	0.0 %	0.0 %	100.0 %	
217	Abutment, Other Materials	LF	2	127.3	<input checked="" type="checkbox"/> %	0.0 %	0.0 %	100.0 %	0.0 %	
243	Culvert, Other	LF along	2	122.0	<input checked="" type="checkbox"/> %	0.0 %	0.0 %	50.0 %	50.0 %	
334	Bridge Railing, Metal, Coated	LF	2	67.9	<input checked="" type="checkbox"/> %	100.0 %	0.0 %	0.0 %	0.0 %	0.0 %



Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, Secretary & CEO
Thomas Tinlin, Acting Administrator



August 19, 2015

**The Board of Selectmen
Town of Arlington
Town Hall
730 Massachusetts Avenue
Arlington, MA 02476**

Attention: Wayne Chouinard, P.E., Town Engineer

SUBJECT: BRIDGE INSPECTION REPORT (NON-NBIS)

A-10-015 (7XF)	US 3 Mystic Street / Mill Brook	RSMI	Dated: 01/21/15
A-10-015 (7XF)	US 3 Mystic Street / Mill Brook	SMI	Dated: 07/27/15

Dear Members of the Board:

As a courtesy, per your request, MassDOT-Highway Division, District 4 Bridge Inspection has performed the inspection of the above "Non-NBIS" bridge. A "Non-NBIS" is a bridge with a clear span of less than 20 feet. Attached is a copy of these reports.

After further review of the inspection report dated Jan. 21, 2015, it has been decided to reduce the Condition Rating Code to 3 (Serious) for items 58 Deck and 59 Superstructures. Copy enclosed. Also enclosed is the July 27, 2015 Special Member Inspection report. We will continue to monitor the condition of these deficiencies.

Repair, rehabilitation or reconstruction of any bridge to address the deficiencies reported is the owner's/custodian's responsibility.

Questions regarding the content of the report may be directed to the District Bridge Inspection Engineer, Thomas Weil, P.E., at 781-674-2172.

Sincerely,

Paul D. Stedman,
Acting District Highway Director

DJC / TW / cab
cc: Brian Clang - BIE, D-4 DHD, D-4 DBIE
Enclosures

519 APPLETON STREET, ARLINGTON, MA 02476

TEL: 781-641-8300, FAX: 781-646-5115

WWW.MASS.GOV/MASSDOT

REPORT B

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 7

2-DIST

B.I.N.

04

7XF

STRUCTURES INSPECTION FIELD REPORT

SPECIAL MEMBER INSPECTION

BR. DEPT. NO.

A-10-015

CITY/TOWN ARLINGTON	8-STRUCTURE NO. A10015-7XF-MUN-BRI	11-KILO. POINT 000.000	90-ROUTINE INSP. DATE Jan 21, 2015	93*-SPEC. MEMB. INSP. DATE Jul 27, 2015												
07-FACILITY CARRIED US 3 MYSTIC ST	MEMORIAL NAME/LOCAL NAME	27-YR BUILT 1850	106-YR REBUILT 1958	*YR REHAB'D (NON 106) 0000												
06-FEATURES INTERSECTED WATER MILL BROOK	26-FUNCTIONAL CLASS Urban Arterial	DIST. BRIDGE INSPECTION ENGINEER T. G. Weil <i>T. Weil</i>														
43-STRUCTURE TYPE 801 : Masonry Slab	22-OWNER Town Agency	21-MAINTAINER Town Agency	TEAM LEADER J. Dideo <i>Joseph J. Dideo</i>													
107-DECK TYPE 9 : Other	WEATHER Clear	TEMP. (air) 27°C	TEAM MEMBERS S. SHAW <i>S. Shaw</i>													
WEIGHT POSTING Not Applicable	X	At bridge	Advance	PLANS (Y/N): Y												
Actual Posting <table border="1"><tr><td>N</td><td>3</td><td>3S2</td><td>Single</td></tr></table>	N	3	3S2	Single		<table border="1"><tr><td>E</td><td>W</td></tr><tr><td></td><td></td></tr></table>	E	W			<table border="1"><tr><td>E</td><td>W</td></tr><tr><td></td><td></td></tr></table>	E	W			(V.C.R.) (Y/N): N
N	3	3S2	Single													
E	W															
E	W															
Recommended Posting <table border="1"><tr><td>N</td><td>N</td><td>N</td><td>N</td></tr></table>	N	N	N	N		<table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>					<table border="1"><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>					TAPE#: _____
N	N	N	N													
Waived Date: 00/00/0000	EJDMT Date: 00/00/0000	Legibility/Visibility														

RATING		Request for Rating or Rerating (Y/N): N		If YES please give priority: HIGH () MEDIUM () LOW ()
Rating Report (Y/N): N	Date: _____	REASON: <i>TW</i>		
Inspection data at time of existing rating 158: - 159: - 160: - 162: - Date: 00/00/0000				

SPECIAL MEMBER(S):

	MEMBER	CRACK (Y/N):	WELD'S CONDITION (0-9)	LOCATION OF CORROSION, SECTION LOSS (%), CRACKS, COLLISION DAMAGE, STRESS CONCENTRATION, ETC.	CONDITION		INV. RATING OF MEMBER FROM RATING ANALYSIS			Deficiencies
					PREVIOUS (0-9)	PRESENT (0-9)	H-20	3	3S2	
A	Item 58.2 - Deck Condition	N	N	See remarks in comments section.	3	3				S-A
B	Item 59.4 - Girders or Beams	N	N	See remarks in comments section.	3	3				S-A
C										
D										
E										

List of field tests performed:

HANDS ON INSPECTION

(Overall Previous)

I-58 I-59 I-60 I-62

3	3	5	-
---	---	---	---

(Overall Current)

3	3	5	-
---	---	---	---

DEFICIENCY A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion of steel, Minor scouring, Clogged drainage, etc.

S= Severe/Major Deficiency - Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroded rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.

C-S= Critical Structural Deficiency - A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

C-H= Critical Hazard Deficiency - A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.

URGENCY OF REPAIR:

I = Immediate - Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the deficiency and to receive further instruction from him/her.

A = ASAP - Action/Repair should be initiated by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) upon receipt of the Inspection Report.

P = Prioritize - Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available.

X=UNKNOWN

N=NOT APPLICABLE

H=HIDDEN/INACCESSIBLE

R=REMOVED

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 27, 2015
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REMARKS**BRIDGE ORIENTATION**

In accordance with the 1958 plans, the approaches and abutments are north and south and the elevations are east and west. There are two spans numbered from south to north. Mill Brook flows from west to east.

GENERAL REMARKS

The original structure was built prior to 1958 at an estimated date of 1850 using granite slabs. In 1958, the structure was widened by adding two reinforced concrete slabs (see **Sketch 1 labeled Span 1 and Span 2 Structural composition**) for approximate locations. Narrow steel I beam sections or possibly rail road tracks were added later. The abutments and pier are comprised of masonry walls.

The west sidewalk beam has extensive deterioration for the full length with exposed rebar. The west bridge railing posts are slightly undermined where they are bolted to this sidewalk beam.

ITEM 58 - DECK**Item 58.2 - Deck Condition**

The deck consists of 10 granite slabs in the south span (span 1), and 12 slabs in the north span, (span 2). Because of two full width transverse cracks and one 2' long longitudinal crack found in three of the granite slabs in the north span, the deck is rated a '3'.

There is a reinforced concrete slab on the east and west side of the structure, where it was widened in 1958. Only the reinforced concrete concrete slabs will be discussed in item 58.2.

Span 1, West slab-Spalled full span x 24" wide x 3" D with some of the exposed rebar corroded and broken.

Span 1-Void just south of utility pipe, adjacent to the south abutment measuring: 18" x 18" x up to 10" Deep.

Spans 1 and 2, East slab-Full length horizontal crack located 4" from bottom of slab and measures up to 1/4" wide.

Span 2, East slab, at the north abutment-Spall with rebar exposed measuring: 2' L x 1' W x 2" D.

ITEM 59 - SUPERSTRUCTURE**Item 59.4 - Girders or Beams**

The reinforced concrete slab is part of the superstructure because it supports itself and is discussed previously in section 58.2.

The granite slabs act as girders and are listed in this section.

There are 4 narrow steel beams in the south span and 14 beams in the north span that are not included in the 1958 plans, and are believed to have been installed at some point after the structure was widened. Only the bottom flanges of these beams are visible and there is only minor rust on the bottom flanges. The beams have a 5-1/2" wide bottom flange and are placed abutting one another so only the bottom face of the bottom flange is visible.

Span 2, 5th granite slab from the east (25' from the east end of structure)-Full width hairline crack at midspan, could not tell if the crack was full height due to the adjacent slabs (**see photos 1 and 2**).

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 27, 2015
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REMARKS**Item 59.4 - Girders or Beams (Cont'd)**

Span 2, 7th granite slab from the east (30' from the east end of structure) -1/4" wide full width x full height crack at midspan (**see photos 3, 4, and 5**).

Span 2, 1st granite slab from the west (15' from the west end of structure)- 2' long longitudinal hairline crack adjacent to the north breastwall (**see photo 6**).

West Sidewalk Beam-Heavily Spalled at the top corner measuring: Full length x up to 20" H x up to 8" D.

East sidewalk Beam-Hairline cracking on bottom face with rust staining in spans 1 and 2.

Sketch / Photo Log

Sketch 1 : SPAN 1 AND SPAN 2 STRUCTURAL COMPOSITION

Photo 1 : Span 2 (North Span), 5th granite slab from the east end, above utility pipe-Full width hairline crack at midspan.

Photo 2 : Span 2 (North Span), 5th granite slab from the east end, above utility pipe-Full width hairline crack at midspan.

Photo 3 : Span 2 (North Span) 7th granite slab from the east-1/4" wide full width x full height crack at midspan, east edge.

Photo 4 : Span 2 (North Span) 7th granite slab from the east-1/4" wide full width x full height crack at midspan, west edge.

Photo 5 : Span 2 (North Span) 7th granite slab from the east-1/4" wide full width x full height crack at midspan.

Photo 6 : Span 2 (North Span) 1st granite slab from the west-2' long longitudinal hairline crack.

CITY/TOWN
ARLINGTONB.I.N.
7XFBR. DEPT. NO.
A-10-015

8. STRUCTURE NO.

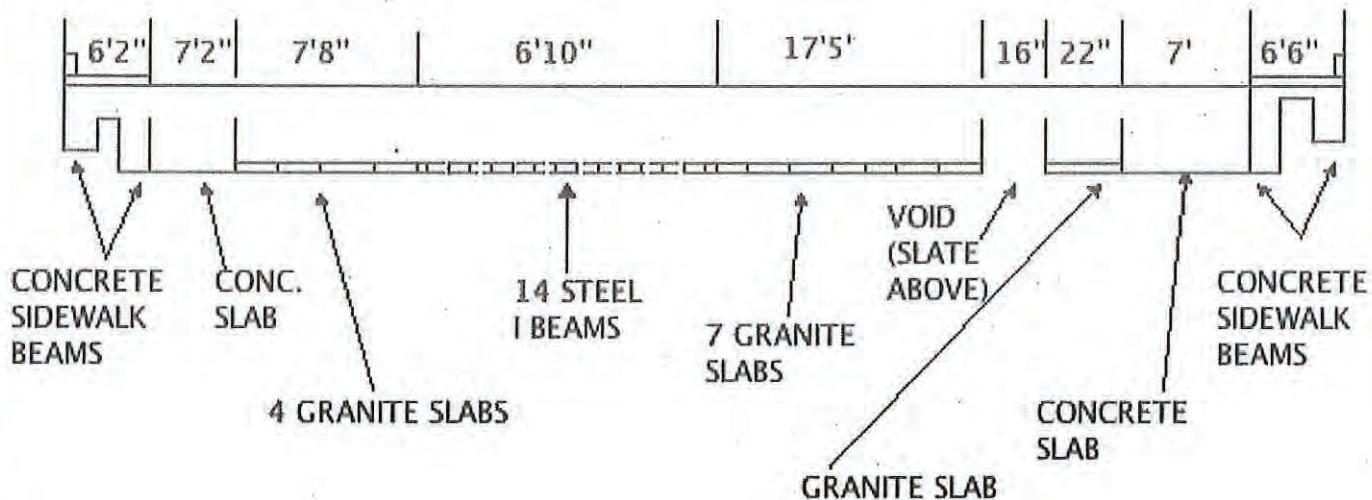
A10015-7XF-MUN-BRI

INSPECTION DATE

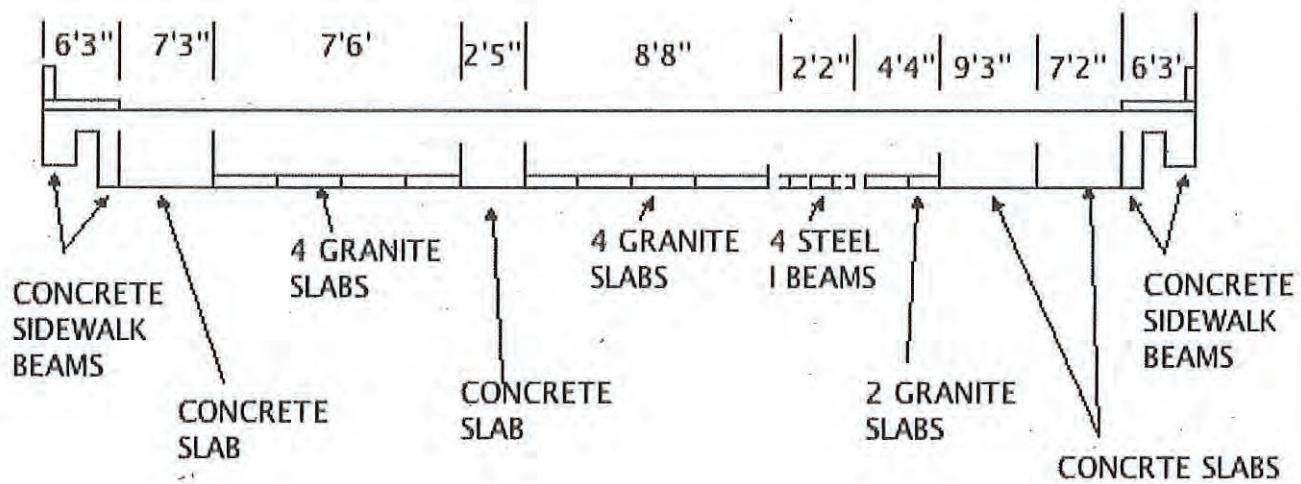
JUL 27, 2015

SKETCHES

SPAN 2 NORTH SPAN LOOKING NORTH



SPAN 1 SOUTH SPAN LOOKING NORTH



Sketch 1: SPAN 1 AND SPAN 2 STRUCTURAL COMPOSITION

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 27, 2015
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PHOTOS

Photo 1: Span 2 (North Span), 5th granite slab from the east end, above utility pipe-Full width hairline crack at midspan.



Photo 2: Span 2 (North Span), 5th granite slab from the east end, above utility pipe-Full width hairline crack at midspan.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 27, 2015
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PHOTOS

Photo 3: Span 2 (North Span) 7th granite slab from the east-1/4" wide full width x full height crack at midspan, east edge.



Photo 4: Span 2 (North Span) 7th granite slab from the east-1/4" wide full width x full height crack at midspan, west edge.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JUL 27, 2015
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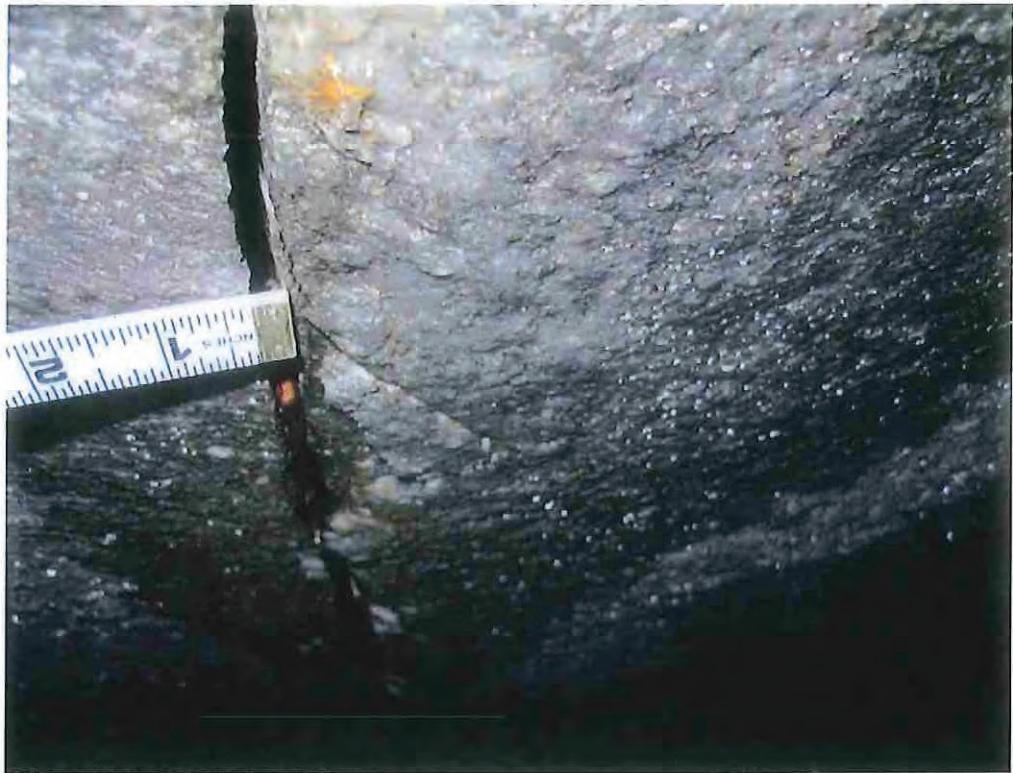
PHOTOS

Photo 5: Span 2 (North Span) 7th granite slab from the east-1/4" wide full width x full height crack at midspan.



Photo 6: Span 2 (North Span) 1st granite slab from the west-2' long longitudinal hairline crack.

REPORT A

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION PAGE 1 OF 22

STRUCTURES INSPECTION FIELD REPORT

ROUTINE & SPECIAL MEMBER INSPECTION

BR. DEPT. NO.

A-10-015

2-DIST
04B.I.N.
7XFCITY/TOWN
ARLINGTON8-STRUCTURE NO.
A10015-7XF-MUN-BRI11-Kilo. POINT
000.00041-STATUS
A:OPEN90-ROUTINE INSP. DATE
JAN 21, 201507-FACILITY CARRIED
US 3 MYSTIC ST

MEMORIAL NAME/LOCAL NAME

27-YR BUILT
1850106-YR REBUILT
1958YR REHAB'D (NON 106)
0000

06-FEATURES INTERSECTED

WATER MILL BROOK

26-FUNCTIONAL CLASS

Urban Arterial

DIST. BRIDGE INSPECTION ENGINEER

T. G. Weil

43-STRUCTURE TYPE
801 : Masonry Slab22-OWNER
Town Agency21-MAINTAINER
Town Agency

TEAM LEADER J. Dideo

107-DECK TYPE
9 : OtherWEATHER
CloudyTEMP. (air)
-7°CTEAM MEMBERS
P. N. SHAH**ITEM 58****3****DECK****DEF**

1.Wearing surface	5
2.Deck Condition	3
3.Stay in place forms	N
4.Curbs	7
5.Median	N
6.Sidewalks	5
7.Parapets	N
8.Railing	4
9.Anti Missile Fence	N
10.Drainage System	6
11.Lighting Standards	N
12.Utilities	7
13.Deck Joints	N
14.	N
15.	N
16.	N

E

W

CURB REVEAL
(In millimeters)**180****150****APPROACHES****DEF**

a. Appr. pavement condition	7
b. Appr. Roadway Settlement	7
c. Appr. Sidewalk Settlement	6
d.	N

OVERHEAD SIGNS (Y/N)
(Attached to bridge)**N****DEF**

a. Condition of Welds	N
b. Condition of Bolts	N
c. Condition of Signs	N

ITEM 59**3****SUPERSTRUCTURE****DEF**

1.Stringers	N
2.Floorbeams	N
3.Floor System Bracing	N
4.Girders or Beams	3
5.Trusses - General	N
a. Upper Chords	N
b. Lower Chords	N
c. Web Members	N
d. Lateral Bracing	N
e. Sway Bracings	N
f. Portals	N
g. End Posts	N

6.Pin & Hangers

N

7.Conn Plt's, Gussets & Angles

-

8.Cover Plates

-

9.Bearing Devices

-

10.Diaphragms/Cross Frames

-

11.Rivets & Bolts

-

12.Welds

-

13.Member Alignment

-

14.Paint/Coating

-

15.

-Year Painted **N**

COLLISION DAMAGE: Please explain

None Minor Moderate Severe

LOAD DEFLECTION: Please explain

None Minor Moderate Severe

LOAD VIBRATION: Please explain

None Minor Moderate Severe Any Fracture Critical Member: (Y/N) **N**Any Cracks: (Y/N) **N****ITEM 60****5****SUBSTRUCTURE****DEF**

1. Abutments

Dive Cur 5

a. Pedestals	N	N	-
b. Bridge Seats	N	H	-
c. Backwalls	N	H	-
d. Breastwalls	N	5	M-P
e. Wingwalls	N	6	-
f. Slope Paving/Rip-Rap	N	N	-
g. Pointing	N	6	M-P
h. Footings	N	H	-
i. Piles	N	N	-
j. Scour	N	7	-
k. Settlement	N	7	-
l. Curtain Wall	N	5	M-P
m.Pier Cap Support	N	6	M-P

2. Piers or Bents

N

a. Pedestals

N N

b. Caps	N	N	-
c. Columns	N	N	-
d. Stems/Webs/Pierwalls	N	6	-
e. Pointing	N	5	M-P
f. Footing	N	N	-
g. Piles	N	N	-
h. Scour	N	N	-
i. Settlement	N	N	-
j.	N	N	-
k.	N	N	-

3. Pile Bents

N

a. Pile Caps

N N

b. Piles	N	N	-
c. Diagonal Bracing	N	N	-
d. Horizontal Bracing	N	N	-
e. Fasteners	N	N	-

UNDERMINING (Y/N) If YES please explain **N**

COLLISION DAMAGE:

None Minor Moderate Severe

SCOUR: Please explain

None Minor Moderate Severe

I-60 (Dive Report):

N

I-60 (This Report):

5

93B-U/W (DIVE) Insp

00/00/0000

X=UNKNOWN

N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE

R=REMOVED

CITY/TOWN ARLINGTON		B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 21, 2015			
ITEM 61 <i>CHANNEL & CHANNEL PROTECTION</i>		5	ITEM 36 TRAFFIC SAFETY		ACCESSIBILITY (Y/N/P)			
			36	COND	DEF			
1. Channel Scour		N	7	-	A. Bridge Railing	0	5	M-P
2. Embankment Erosion		N	4	S-A	B. Transitions	0	0	S-A
3. Debris		N	4	S-P	C. Approach Guardrail	0	0	S-A
4. Vegetation		N	6	-	D. Approach Guardrail Ends	0	0	S-A
5. Utilities		N	7	-				
6. Rip-Rap/Slope Protection		N	N	-				
7. Aggradation		N	5	S-P				
8. Fender System		N	N	-				
STREAM FLOW VELOCITY:								
Tidal () High () Moderate () Low (X) None ()								
ITEM 61 (Dive Report): <input type="checkbox"/> ITEM 61 (This Report): <input type="checkbox"/> 5								
93b-U/W INSPI. DATE: 00/00/0000								
RATING								
Rating Report (Y/N): <input type="checkbox"/>								
Date: 00/00/0000								
Inspection data at time of existing rating 158: - 159: - 160: - Date :00/00/0000								
		(To be filled out by DBIE)						
		Request for Rating or Rerating (Y/N): <input type="checkbox"/>						
		If YES please give priority: HIGH () MEDIUM () LOW ()						
		REASON: <i>fw</i>						
CONDITION RATING GUIDE (For Items 58, 59, 60 and 61)								
CODE	CONDITION	DEFECTS						
N	NOT APPLICABLE							
G 9	EXCELLENT	Excellent condition.						
G 8	VERY GOOD	No problem noted.						
G 7	GOOD	Some minor problems.						
F 6	SATISFACTORY	Structural elements show some minor deterioration.						
F 5	FAIR	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.						
P 4	POOR	Advance section loss, deterioration, spalling or scour.						
P 3	SERIOUS	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.						
C 2	CRITICAL	Advance deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.						
C 1	"IMMINENT" FAILURE	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put it back in light service.						
0	FAILED	Out of service - beyond corrective action.						
DEFICIENCY REPORTING GUIDE								
DEFICIENCY A defect in a structure that requires corrective action.								
CATEGORIES OF DEFICIENCIES:								
M= Minor Deficiency - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion of steel, Minor scouring, Clogged drainage, etc.								
S= Severe/Major Deficiency - Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroded rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.								
C-S= Critical Structural Deficiency - A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.								
C-H= Critical Hazard Deficiency - A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.								
URGENCY OF REPAIR:								
I = Immediate - [Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the Deficiency and to receive further instruction from him/her].								
A = ASAP - [Action/Repair should be initiated by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) upon receipt of the Inspection Report].								
P = Prioritize - [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].								

STRUCTURES INSPECTION FIELD REPORT

2-DIST
04

B.I.N.
7XF

BR. DEPT. NO.
A-10-015

RATING	Request for Rating or Rerating (Y/N):	If YES please give priority:	
Rating Report (Y/N):	N	Date: _____	HIGH () MEDIUM () LOW ()
Inspection data at time of existing rating			
158: -	159: -	160: -	162: -
Date :00/00/0000			

SPECIAL MEMBER(S):

List of field tests performed:

I-58 I-59 I-60 I-62

5	5	5	-
3	3	5	-

DEFICIENCY A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion of steel, Minor scouring, Clogged drainage, etc.

S= Severe/Major Deficiency - Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroded rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.

C-S= Critical Structural Deficiency - A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

C-H= Critical Hazard Deficiency - A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.

URGENCY OF REPAIR:

I = Immediate- [Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the Deficiency and to receive further instruction from him/her].

A = ASAP- [Action/Repair should be initiated by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) upon receipt of the Inspection Report].

P = Prioritize [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

X=UNKNOWN

N=NOT APPLICABLE

H=HIDDEN/INACCESSIBLE

R=REMOVED

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 21, 2015
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REMARKS**BRIDGE ORIENTATION**

In accordance with the 1958 plans, the approaches and abutments are north and south and the elevations are east and west. There are two spans numbered from south to north. Mill Brook flows from west to east.

GENERAL REMARKS

The original structure was built prior to 1958 at an estimated date of 1850 using granite slabs. In 1958, the structure was widened by adding two reinforced concrete slabs (see Sketch 1 Labeled Span 1 and Span 2 Structural composition) for approximate locations. Narrow steel I beam sections or possibly rail road tracks were added later. The abutments and pier are comprised of masonry walls.

The west sidewalk beam has extensive deterioration for the full length with exposed rebar. The west bridge railing posts are slightly undermined where they are bolted to this sidewalk beam.

ITEM 58 - DECK**Item 58.1 - Wearing surface**

There are several large bituminous patches with several light transverse, longitudinal, and map cracks throughout. Also, the bituminous concrete wearing surface has several shallow potholes in the southbound breakdown lane (see photo 1).

Item 58.2 - Deck Condition

The deck consists of 10 granite slabs in the south span (span 1), and 11 slabs in the north span, (span 2). Because of two full width transverse cracks and one 2' long longitudinal crack found in three of the granite slabs in the north span, the deck is rated a '3'.

There is a reinforced concrete slab on the east and west side of the structure, where it was widened in 1958. Only the reinforced concrete concrete slabs will be discussed in item 58.2.

Span 1, West slab-Spalled full span x 24" wide x 3" D with some of the exposed rebar corroded and broken (see photo 2).

Span 1-Void just south of utility pipe, adjacent to the south abutment measuring: 18" x 18" x up to 10" Deep (see photos 3 and 4).

Spans 1 and 2, East slab-Full length horizontal crack located 4" from bottom of slab and measures up to 1/4" wide (see photo 5).

Span 2, East slab, at the north abutment-Spall with rebar exposed measuring: 2' L x 1' W x 2" D. (see photo 6).

Item 58.6 - Sidewalks

West sidewalk-There is a hole behind the north abutment measuring: 15" L x 7" W x 13" D (see photo 7).

West sidewalk, looking north-asphalt overlay breaking up, full length with transverse, longitudinal, and map cracks throughout (see photo 8).

West sidewalk looking south-asphalt overlay is breaking up exposing several reinforcing bars. (see photo 9).

East sidewalk-Several random hairline transverse cracks throughout.

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REMARKS**Item 58.8 - Railing**

Bridge railing post 4 is undermined where it attaches to the west sidewalk beam (see photo 10). Spalled sidewalk beam is causing posts 2, 3, and 4 out of 5 posts to be partially undermined (see photo 11).

Item 58.10 - Drainage System

There are several missing chinking stones located at the outlet of each of the drainage pipes that discharge storm water into the brook (see photos 12 and 13).

APPROACHES**Approaches c - Appr. Sidewalk Settlement**

There is 2" settlement located at the northeast approach sidewalk (see photo 14).

ITEM 59 - SUPERSTRUCTURE**Item 59.4 - Girders or Beams**

The reinforced concrete slab is part of the superstructure because it supports itself and is discussed previously in section 58.2.

The granite slabs act as girders and are listed in this section.

Lastly, there are 4 narrow steel beams in each span that are not included in the 1958 plans, and are believed to have been installed at some point after the structure was widened. Only the bottom flanges of these beams are visible and there is only minor rust on the bottom flanges. The beams have a 5-1/2" wide bottom flange and are placed abutting one another so only the bottom face of the bottom flange is visible.

Span 2, 5th granite slab from the east (25' from the east end of structure)-Full width hairline crack at midspan, could not tell if the crack was full height (see photo 15).

Span 2, 7th granite slab from the east (30' from the east end of structure) -1/4" wide full width x full height crack at midspan (see photo 16).

Span 2, 1st granite slab from the west (52' from the east end/ 15' from the west end of structure)- 2' long longitudinal hairline crack adjacent to the north breastwall (see photo 17).

West Sidewalk Beam-Heavily Spalled at the top corner measuring: Full length x up to 20" H x up to 8" D (see photo 18 and 19).

East sidewalk Beam-Hairline cracking on bottom face with rust staining in spans 1 and 2 (see photo 20).

ITEM 60 - SUBSTRUCTURE**Item 60.1 - Abutments****Item 60.1.d - Breastwalls**

There are several missing chinking stones/ pointing throughout both breastwalls, particularly around the drain pipes.

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REMARKS**Item 60.1 - Abutments****Item 60.1.d - Breastwalls (Cont'd)**

South breastwall between drainage pipes-missing chinking stones. Void below west drain pipe measuring: 18" L X 10" H X 16" D (see photo 12).

North breastwall, 5' from the east end-Voids around utility pipe (see photo 13).

North breastwall, span 2, west end-2nd course of blocks from the bottom-Void measuring 3' L x 7" H x 22" D (see photo 21).

Item 60.1.q - Pointing

There are several areas throughout the abutments and the pier that are missing pointing between stones.

Item 60.1.m - Pier Cap Support

Sidewalk support, south face, bottom corner - Spall measuring: 25" L x 4" H x 4" D (see photo 22).

Item 60.2 - Piers or Bents**Item 60.2.e - Pointing**

There are several areas throughout the pier that could use pointing (see photos 23 and 24).

SubStructure Scour Notes

There is moderate scour at the upstream end of the structure in span 2, adjacent to the north breast wall.

ITEM 61 - CHANNEL AND CHANNEL PROTECTION**Item 61.2 - Embankment Erosion**

There is considerable erosion located at the southwest embankment causing the flow in span 1 to be restricted (see photo 25).

Item 61.3 - Debris

There is a large amount of debris located at the upstream end of the structure, partially restricting the flow of the Mill Brook in span 2 (see photo 26).

Item 61.7 - Aggradation

There is a considerable amount of aggradation at the upstream end of the channel partially restricting flow in span 1 (see photo 27).

TRAFFIC SAFETY**Item 36a - Bridge Railing**

Metal Bridge Railing Type H.

Item 36b - Transitions

Transitions do not exist.

Item 36c - Approach Guardrail

Approach guardrail does not exist.

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REMARKS**Item 36d - Approach Guardrail Ends**

Approach guardrail ends do not exist.

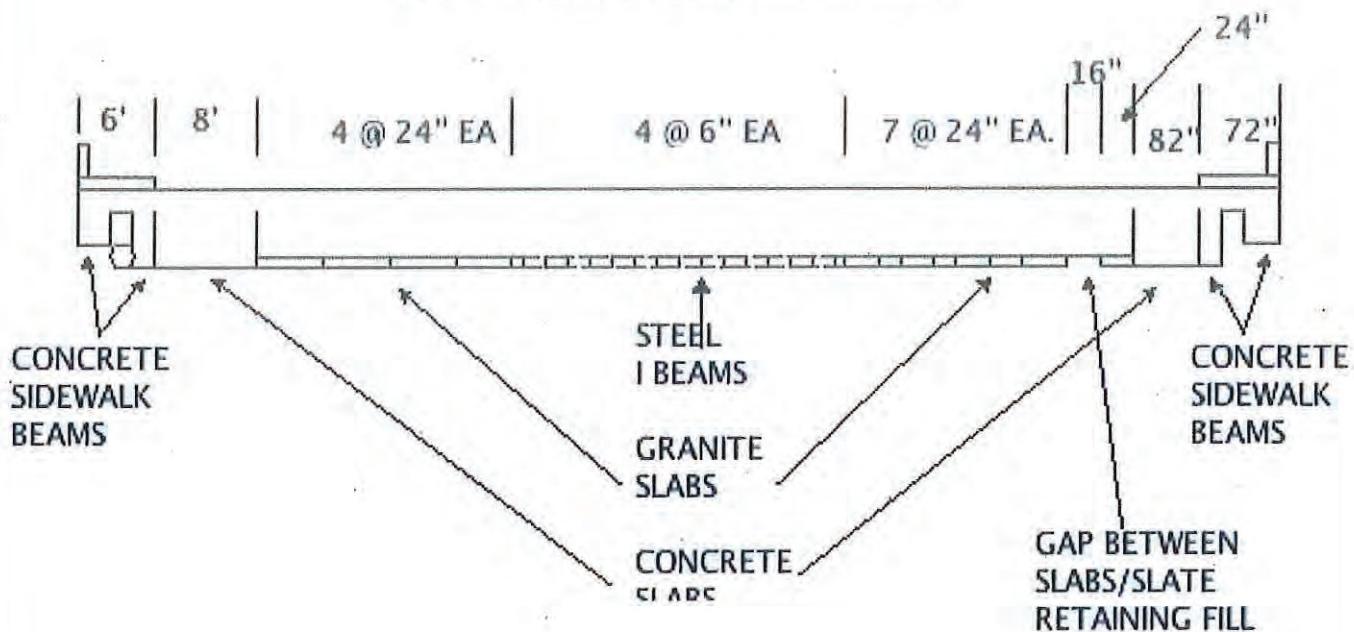
Sketch / Photo Log

- Sketch 1 : SPAN 1 AND SPAN 2 STRUCTURAL COMPOSITION
- Photo 1 : Wearing surface-Several large patches with several light transverse, longitudinal, and map cracks throughout and several shallow potholes in the breakdown lane.
- Photo 2 : Span 1-Concrete slab, west end, spalled full length x 24" wide x 3" D with some corroded and broken rebar on the bottom course.
- Photo 3 : Span 1-Void just south of utility pipe, adjacent to the south abutment measuring: 18" x 18" x up to 10" Deep.
- Photo 4 : Span 1-Void just south of utility pipe, adjacent to the south abutment measuring: 18" x 18" x up to 10" Deep.
- Photo 5 : Span 1 and 2 East slab-Full length horizontal crack located 4" from bottom of slab and measures up to 1/4" wide.
- Photo 6 : Span 2, east end, at the north abutment-Spall with rebar exposed measuring: 2' L x 1' W x 2" D.
- Photo 7 : West sidewalk-Hole behind the north backwall measuring: 15" L x 7" W x 13" D.
- Photo 8 : West sidewalk looking north-asphalt overlay breaking up, full length with transverse, longitudinal, and map cracks throughout.
- Photo 9 : West sidewalk looking south-asphalt overlay is breaking up with several reinforcing bars exposed.
- Photo 10 : Bridge railing post 4 is partially undermined where it attaches to the west sidewalk beam.
- Photo 11 : Spalled sidewalk beam has partially undermined posts 2, 3, and 4 out of 5 posts.
- Photo 12 : South breastwall between drainage pipes-missing chinking stones. Void below west drain pipe measuring: 18" L X 10" H X 16" D.
- Photo 13 : North breastwall, 5' from the east end-Voids around utility pipe.
- Photo 14 : Northeast approach sidewalk-2" Settlement.
- Photo 15 : Span 2, 5th granite slab from the east-Full width hairline crack at midspan (slab located over utility pipe)
- Photo 16 : Span 2, 7th granite slab from the east-1/4" wide full width x full height crack at midspan.
- Photo 17 : Span 2, north end, 1st granite block from the west- 2' long longitudinal hairline crack.
- Photo 18 : West Sidewalk Beam-Heavily Spalled at the top corner measuring: Full length x up to 20" H x up to 8" D.
- Photo 19 : West Sidewalk Beam-Heavily Spalled at the top corner measuring: Full length x up to 20" H x up to 8" D.
- Photo 20 : East sidewalk beam-Hairline cracking on bottom face with rust staining in spans 1 and 2.
- Photo 21 : Span 2, north breastwall, west end-2nd course of blocks from the bottom-Void measuring 3' L x 7" H x 22" D.
- Photo 22 : Sidewalk support, south face, bottom corner - Spall measuring: 25" L x 4" H x 4" D.
- Photo 23 : Granite pier-void in span 1, 5' from the west end measuring: 10" L x 8" H x 16" D.
- Photo 24 : Granite pier-void in span 1, 22' from the west end measuring: 1' Wide x 14" H x full depth penetration.
- Photo 25 : West elevation-Large amount of erosion at the southwest embankment causing flow to be greatly restricted in span 1.
- Photo 26 : Span 2-Build up of tree branches and debris at the upstream end of channel.
- Photo 27 : Upstream end of structure-Heavy aggradation and debris restricting flow in span 1.

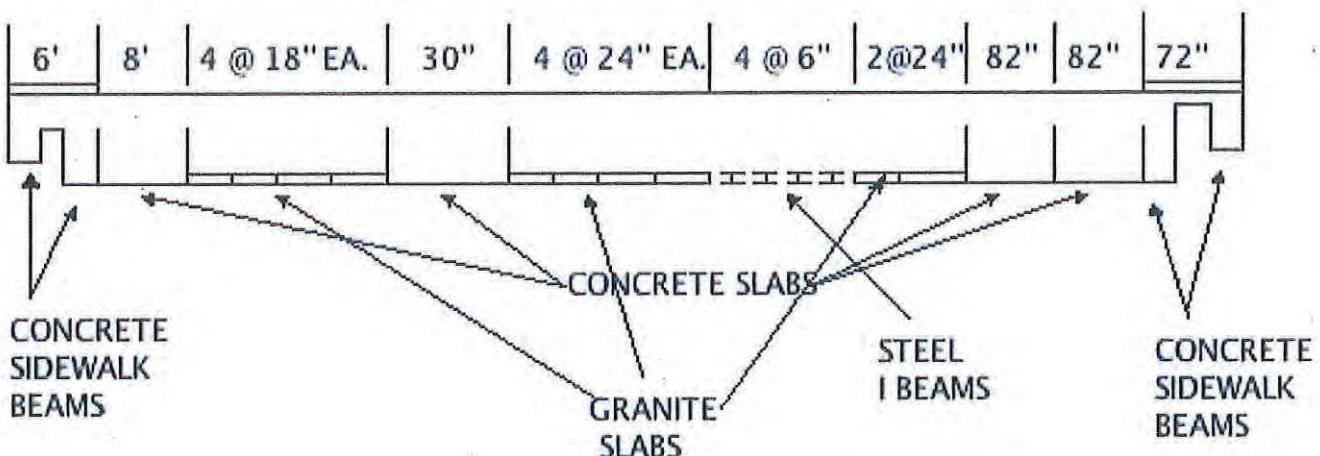
CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 21, 2015
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SKETCHES

SPAN 2 NORTH SPAN LOOKING NORTH



SPAN 1 SOUTH SPAN LOOKING NORTH



Sketch 1: SPAN 1 AND SPAN 2 STRUCTURAL COMPOSITION

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PHOTOS

Photo 1: Wearing surface-Several large patches with several light transverse, longitudinal, and map cracks throughout and several shallow potholes in the breakdown lane.



Photo 2: Span 1-Concrete slab, west end, spalled full length x 24" wide x 3" D with some corroded and broken rebar on the bottom course.

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PHOTOS

Photo 3: Span 1-Void just south of utility pipe, adjacent to the south abutment measuring: 18" x 18" x up to 10" Deep.



Photo 4: Span 1-Void just south of utility pipe, adjacent to the south abutment measuring: 18" x 18" x up to 10" Deep.

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PHOTOS

Photo 5: Span 1 and 2 East slab-Full length horizontal crack located 4" from bottom of slab and measures up to 1/4" wide.



Photo 6: Span 2, east end, at the north abutment-Spall with rebar exposed measuring: 2' L x 1' W x 2" D.

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PHOTOS

Photo 7: West sidewalk-Hole behind the north backwall measuring: 15" L x 7" W x 13" D.



Photo 8: West sidewalk looking north-asphalt overlay breaking up, full length with transverse, longitudinal, and map cracks throughout.

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PHOTOS

Photo 9: West sidewalk looking south-asphalt overlay is breaking up with several reinforcing bars exposed.



Photo 10: Bridge railing post 4 is partially undermined where it attaches to the west sidewalk beam.

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PHOTOS

Photo 11: Spalled sidewalk beam has partially undermined posts 2, 3, and 4 out of 5 posts.



Photo 12: South breastwall between drainage pipes-missing chinking stones. Void below west drain pipe measuring: 18" L X 10" H X 16" D.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 21, 2015
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PHOTOS

Photo 13: North breastwall, 5' from the east end-Voids around utility pipe.



Photo 14: Northeast approach sidewalk-2" Settlement.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 21, 2015
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PHOTOS

Photo 15: Span 2, 5th granite slab from the east-Full width hairline crack at midspan (slab located over utility pipe)



Photo 16: Span 2, 7th granite slab from the east-1/4" wide full width x full height crack at midspan.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 21, 2015
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PHOTOS

Photo 17: Span 2, north end, 1st granite block from the west- 2' long longitudinal hairline crack.



Photo 18: West Sidewalk Beam-Heavily Spalled at the top corner measuring:
Full length x up to 20" H x up to 8" D.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 21, 2015
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PHOTOS

Photo 19: West Sidewalk Beam-Heavily Spalled at the top corner measuring:
Full length x up to 20" H x up to 8" D.



Photo 20: East sidewalk beam-Hairline cracking on bottom face with rust staining in spans 1 and 2.

CITY/TOWN
ARLINGTONB.I.N.
7XFBR. DEPT. NO.
A-10-015

8.-STRUCTURE NO.

A10015-7XF-MUN-BRI

INSPECTION DATE
JAN 21, 2015**PHOTOS**

Photo 21: Span 2, north breastwall, west end-2nd course of blocks from the bottom-Void measuring 3' L x 7" H x 22" D.



Photo 22: Sidewalk support, south face, bottom corner - Spall measuring: 25" L x 4" H x 4" D.

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PHOTOS

Photo 23: Granite pier-void in span 1, 5' from the west end measuring: 10" L x 8" H x 16" D.



Photo 24: Granite pier-void in span 1, 22' from the west end measuring: 1' Wide x 14" H x full depth penetration.

CITY/TOWN ARLINGTON	B.I.N. 7XF	BR. DEPT. NO. A-10-015	8.-STRUCTURE NO. A10015-7XF-MUN-BRI	INSPECTION DATE JAN 21, 2015
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PHOTOS

Photo 25: West elevation-Large amount of erosion at the southwest embankment causing flow to be greatly restricted in span 1.



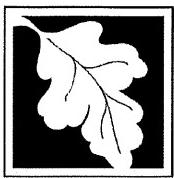
Photo 26: Span 2-Build up of tree branches and debris at the upstream end of channel.

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PHOTOS

Photo 27: Upstream end of structure-Heavy aggradation and debris restricting flow in span 1.

APPENDIX E: Order of Conditions with Resource Area Plan



**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands**

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

091-0349

MassDEP File #

eDEP Transaction #

Arlington

City/Town

A. General Information

Please note:
this form has
been modified
with added
space to
accommodate
the Registry
of Deeds
Requirements

Important:
When filling
out forms on
the
computer,
use only the
tab key to
move your
cursor - do
not use the
return key.

1. From: Arlington
Conservation Commission

2. This issuance is for
(check one): Order of Conditions Amended Order of Conditions

3. To: Applicant:

Wayne	Chouinard
a. First Name	b. Last Name

Town of Arlington Engineering Division
c. Organization

51 Grove Street
d. Mailing Address

Arlington	MA	02476
e. City/Town	f. State	g. Zip Code

4. Property Owner (if different from applicant):

a. First Name	b. Last Name
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Town of Arlington
c. Organization

730 Massachusetts Avenue
d. Mailing Address

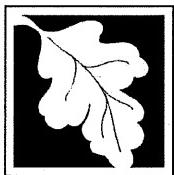
Arlington	MA	02476
e. City/Town	f. State	g. Zip Code

5. Project Location:

Mystic Street at Mill Brook	Arlington
a. Street Address	b. City/Town

Block Plan 49 & 63	d. Parcel/Lot Number
c. Assessors Map/Plat Number	

Latitude and Longitude, if known:	d	m	s	d	m	s
	d. Latitude			e. Longitude		



**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands**
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
091-0349
MassDEP File #

eDEP Transaction #
Arlington
City/Town

A. General Information (cont.)

6. Property recorded at the Registry of Deeds for (attach additional information if more than one parcel):

a. County	b. Certificate Number (if registered land)		
c. Book	d. Page		
7. Dates:	a. Date Notice of Intent Filed	02/02/23	02/14/23
	b. Date Public Hearing Closed	c. Date of Issuance	
8. Final Approved Plans and Other Documents (attach additional plan or document references as needed): SEE ATTACHED			
a. Plan Title			
b. Prepared By	c. Signed and Stamped by		
d. Final Revision Date	e. Scale		
f. Additional Plan or Document Title	g. Date		

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act:

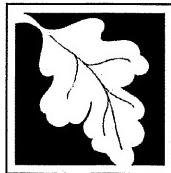
Following the review of the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act (the Act). Check all that apply:

- | | | |
|--|--|--|
| a. <input type="checkbox"/> Public Water Supply | b. <input type="checkbox"/> Land Containing Shellfish | c. <input checked="" type="checkbox"/> Prevention of Pollution |
| d. <input type="checkbox"/> Private Water Supply | e. <input type="checkbox"/> Fisheries | f. <input type="checkbox"/> Protection of Wildlife Habitat |
| g. <input type="checkbox"/> Groundwater Supply | h. <input checked="" type="checkbox"/> Storm Damage Prevention | i. <input checked="" type="checkbox"/> Flood Control |

2. This Commission hereby finds the project, as proposed, is: (check one of the following boxes)

Approved subject to:

- a. the following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.



**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 5 – Order of Conditions**
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

091-0349

MassDEP File #

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Arlington

City/Town

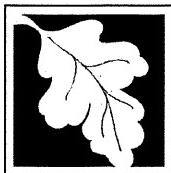
B. Findings (cont.)

Denied because:

- b. the proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect the interests of the Act, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**
- c. the information submitted by the applicant is not sufficient to describe the site, the work, or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the Act's interests, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**
- 3. Buffer Zone Impacts: Shortest distance between limit of project disturbance and the wetland resource area specified in 310 CMR 10.02(1)(a) a. linear feet

Inland Resource Area Impacts: Check all that apply below. (For Approvals Only)

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. <input type="checkbox"/> Bank	a. linear feet	b. linear feet	c. linear feet	d. linear feet
5. <input type="checkbox"/> Bordering Vegetated Wetland	a. square feet	b. square feet	c. square feet	d. square feet
6. <input checked="" type="checkbox"/> Land Under Waterbodies and Waterways	100 a. square feet 0 e. c/y dredged	100 b. square feet 0 f. c/y dredged	c. square feet	d. square feet
7. <input type="checkbox"/> Bordering Land Subject to Flooding	a. square feet	b. square feet	c. square feet	d. square feet
Cubic Feet Flood Storage	e. cubic feet	f. cubic feet	g. cubic feet	h. cubic feet
8. <input type="checkbox"/> Isolated Land Subject to Flooding	a. square feet	b. square feet		
Cubic Feet Flood Storage	c. cubic feet	d. cubic feet	e. cubic feet	f. cubic feet
9. <input checked="" type="checkbox"/> Riverfront Area	6,300 a. total sq. feet 389 c. square feet	6,300 b. total sq. feet 389 d. square feet	e. square feet	f. square feet
Sq ft within 100 ft	g. square feet	h. square feet	i. square feet	j. square feet
Sq ft between 100-200 ft				



**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands**

WPA Form 5 – Order of Conditions

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

091-0349

MassDEP File #

eDEP Transaction #

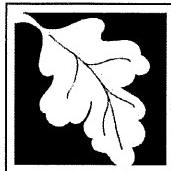
Arlington

City/Town

B. Findings (cont.)

Coastal Resource Area Impacts: Check all that apply below. (For Approvals Only)

	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
10. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below			
11. <input type="checkbox"/> Land Under the Ocean	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
12. <input type="checkbox"/> Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes below			
13. <input type="checkbox"/> Coastal Beaches	a. square feet	b. square feet	c. cu yd	d. cu yd
14. <input type="checkbox"/> Coastal Dunes	a. square feet	b. square feet	c. cu yd	d. cu yd
15. <input type="checkbox"/> Coastal Banks	a. linear feet	b. linear feet		
16. <input type="checkbox"/> Rocky Intertidal Shores	a. square feet	b. square feet		
17. <input type="checkbox"/> Salt Marshes	a. square feet	b. square feet	c. square feet	d. square feet
18. <input type="checkbox"/> Land Under Salt Ponds	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
19. <input type="checkbox"/> Land Containing Shellfish	a. square feet	b. square feet	c. square feet	d. square feet
20. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, Inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above			
	a. c/y dredged	b. c/y dredged		
21. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	a. square feet	b. square feet		
22. <input type="checkbox"/> Riverfront Area	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	g. square feet	h. square feet	i. square feet	j. square feet



**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands**
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
091-0349

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Arlington

City/Town

B. Findings (cont.)

* #23. If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.5.c (BVW) or B.17.c (Salt Marsh) above, please enter the additional amount here.

23. Restoration/Enhancement *:

a. square feet of BVW

b. square feet of salt marsh

24. Stream Crossing(s):

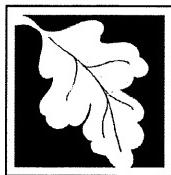
a. number of new stream crossings

b. number of replacement stream crossings

C. General Conditions Under Massachusetts Wetlands Protection Act

The following conditions are only applicable to Approved projects.

1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.
2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.
3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.
4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
 - a. The work is a maintenance dredging project as provided for in the Act; or
 - b. The time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.
 - c. If the work is for a Test Project, this Order of Conditions shall be valid for no more than one year.
5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order. An Order of Conditions for a Test Project may be extended for one additional year only upon written application by the applicant, subject to the provisions of 310 CMR 10.05(11)(f).
6. If this Order constitutes an Amended Order of Conditions, this Amended Order of Conditions does not extend the issuance date of the original Final Order of Conditions and the Order will expire on 02/14/26 unless extended in writing by the Department.
7. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.



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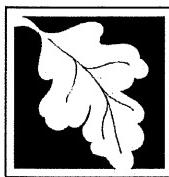
C. General Conditions Under Massachusetts Wetlands Protection Act

8. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed.
9. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land upon which the proposed work is to be done. In the case of the registered land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to the Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work.
10. A sign shall be displayed at the site not less than two square feet or more than three square feet in size bearing the words,

"Massachusetts Department of Environmental Protection" [or, "MassDEP"]

"File Number 091-0349 "

11. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before MassDEP.
12. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.
13. The work shall conform to the plans and special conditions referenced in this order.
14. Any change to the plans identified in Condition #13 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.
15. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.
16. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.



Massachusetts Department of Environmental Protection

Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

17. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.

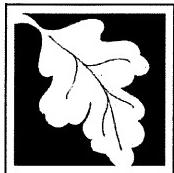
18. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

19. The work associated with this Order (the "Project")
 - (1) is subject to the Massachusetts Stormwater Standards
 - (2) is NOT subject to the Massachusetts Stormwater Standards

If the work is subject to the Stormwater Standards, then the project is subject to the following conditions:

- a) All work, including site preparation, land disturbance, construction and redevelopment, shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Construction General Permit as required by Stormwater Condition 8. Construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall remain in place until the site is fully stabilized.

- b) No stormwater runoff may be discharged to the post-construction stormwater BMPs unless and until a Registered Professional Engineer provides a Certification that:
 - i. all construction period BMPs have been removed or will be removed by a date certain specified in the Certification. For any construction period BMPs intended to be converted to post construction operation for stormwater attenuation, recharge, and/or treatment, the conversion is allowed by the MassDEP Stormwater Handbook BMP specifications and that the BMP has been properly cleaned or prepared for post construction operation, including removal of all construction period sediment trapped in inlet and outlet control structures;
 - ii. as-built final construction BMP plans are included, signed and stamped by a Registered Professional Engineer, certifying the site is fully stabilized;
 - iii. any illicit discharges to the stormwater management system have been removed, as per the requirements of Stormwater Standard 10;



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Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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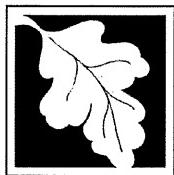
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C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

- iv. all post-construction stormwater BMPs are installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure that they are not damaged and that they are in proper working condition;
- v. any vegetation associated with post-construction BMPs is suitably established to withstand erosion.
- c) The landowner is responsible for BMP maintenance until the issuing authority is notified that another party has legally assumed responsibility for BMP maintenance. Prior to requesting a Certificate of Compliance, or Partial Certificate of Compliance, the responsible party (defined in General Condition 18(e)) shall execute and submit to the issuing authority an Operation and Maintenance Compliance Statement ("O&M Statement") for the Stormwater BMPs identifying the party responsible for implementing the stormwater BMP Operation and Maintenance Plan ("O&M Plan") and certifying the following:
 - i.) the O&M Plan is complete and will be implemented upon receipt of the Certificate of Compliance, and
 - ii.) the future responsible parties shall be notified in writing of their ongoing legal responsibility to operate and maintain the stormwater management BMPs and implement the Stormwater Pollution Prevention Plan.
- d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Pollution Discharge Elimination System Multi-Sector General Permit.
- e) Unless and until another party accepts responsibility, the landowner, or owner of any drainage easement, assumes responsibility for maintaining each BMP. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement of record, acceptable to the issuing authority, evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 18(f) through 18(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 18(f) through 18(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.
- f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the O&M Plan, and the requirements of the Massachusetts Stormwater Handbook.



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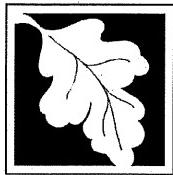
C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

- g) The responsible party shall:
 - 1. Maintain an operation and maintenance log for the last three (3) consecutive calendar years of inspections, repairs, maintenance and/or replacement of the stormwater management system or any part thereof, and disposal (for disposal the log shall indicate the type of material and the disposal location);
 - 2. Make the maintenance log available to MassDEP and the Conservation Commission ("Commission") upon request; and
 - 3. Allow members and agents of the MassDEP and the Commission to enter and inspect the site to evaluate and ensure that the responsible party is in compliance with the requirements for each BMP established in the O&M Plan approved by the issuing authority.
- h) All sediment or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.
- i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.
- j) The stormwater management system approved in the Order of Conditions shall not be changed without the prior written approval of the issuing authority.
- k) Areas designated as qualifying pervious areas for the purpose of the Low Impact Site Design Credit (as defined in the MassDEP Stormwater Handbook, Volume 3, Chapter 1, Low Impact Development Site Design Credits) shall not be altered without the prior written approval of the issuing authority.
- l) Access for maintenance, repair, and/or replacement of BMPs shall not be withheld. Any fencing constructed around stormwater BMPs shall include access gates and shall be at least six inches above grade to allow for wildlife passage.

Special Conditions (if you need more space for additional conditions, please attach a text document):

SEE ATTACHED

20. For Test Projects subject to 310 CMR 10.05(11), the applicant shall also implement the monitoring plan and the restoration plan submitted with the Notice of Intent. If the conservation commission or Department determines that the Test Project threatens the public health, safety or the environment, the applicant shall implement the removal plan submitted with the Notice of Intent or modify the project as directed by the conservation commission or the Department.



**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands**
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D. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? Yes No
2. The Arlington _____ hereby finds (check one that applies):
 - a. that the proposed work cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw, specifically:

1. Municipal Ordinance or Bylaw

2. Citation

Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order of Conditions is issued.

- b. that the following additional conditions are necessary to comply with a municipal ordinance or bylaw:

Arlington Bylaw for Wetlands Protection

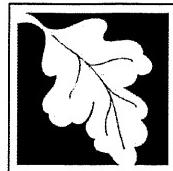
Title V,
Article 8

1. Municipal Ordinance or Bylaw

3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.

The special conditions relating to municipal ordinance or bylaw are as follows (if you need more space for additional conditions, attach a text document):

SEE ATTACHED



**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands**
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E. Signatures

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.

02-23-23

1. Date of Issuance

Please indicate the number of members who will sign this form.

4

This Order must be signed by a majority of the Conservation Commission.

2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

	Susan Chaynick
Signature	Printed Name
	David E. White
Signature	Printed Name
	Pamela Heidt
Signature	Printed Name
	Charles J. Irone
Signature	Printed Name

	Susan Chaynick
Signature	Printed Name
	David E. White
Signature	Printed Name
	Pamela Heidt
Signature	Printed Name
	Charles J. Irone
Signature	Printed Name

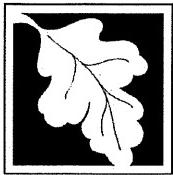
by hand delivery on

02-23-23

Date

by certified mail, return receipt requested, on

Date



**Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands**
WPA Form 5 – Order of Conditions
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

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Arlington

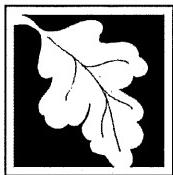
City/Town

F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order, or providing written information to the Department prior to issuance of a Superseding Order.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.



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G. Recording Information

Prior to commencement of work, this Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

Conservation Commission

Please be advised that the Order of Conditions for the Project at:

Project Location

MassDEP File Number

Has been recorded at the Registry of Deeds of:

County

Book

Page

for: Property Owner

and has been noted in the chain of title of the affected property in:

Book

Page

In accordance with the Order of Conditions issued on:

Date

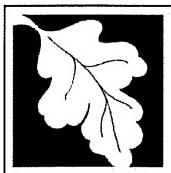
If recorded land, the instrument number identifying this transaction is:

Instrument Number

If registered land, the document number identifying this transaction is:

Document Number

Signature of Applicant



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
Request for Departmental Action Fee
Transmittal Form

DEP File Number:

Provided by DEP

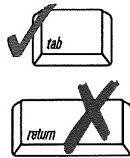
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. Request Information

1. Location of Project

a. Street Address	b. City/Town, Zip
c. Check number	d. Fee amount

Important:
 When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



2. Person or party making request (if appropriate, name the citizen group's representative):

Name		
Mailing Address		
City/Town	State	Zip Code
Phone Number	Fax Number (if applicable)	

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

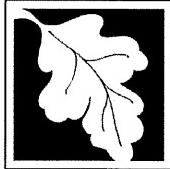
Name		
Mailing Address		
City/Town	State	Zip Code
Phone Number	Fax Number (if applicable)	

4. DEP File Number:

B. Instructions

1. When the Departmental action request is for (check one):

- Superseding Order of Conditions – Fee: \$120.00 (single family house projects) or \$245 (all other projects)
- Superseding Determination of Applicability – Fee: \$120
- Superseding Order of Resource Area Delineation – Fee: \$120

**Massachusetts Department of Environmental Protection**

Bureau of Resource Protection - Wetlands

DEP File Number:

**Request for Departmental Action Fee
Transmittal Form**

Provided by DEP

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Instructions (cont.)

Send this form and check or money order, payable to the *Commonwealth of Massachusetts*, to:

Department of Environmental Protection
Box 4062
Boston, MA 02211

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.
3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see <https://www.mass.gov/service-details/massdep-regional-offices-by-community>).
4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

ARLINGTON CONSERVATION COMMISSION
APPROVAL ORDER OF CONDITIONS – Mystic Street Bridge
MassDEP File # 091-0349

UNDER THE WETLANDS PROTECTION ACT and ARLINGTON BYLAW FOR WETLANDS PROTECTION
Bridge Demolition and Reconstruction
02/13/2023

Documents Reviewed

1. Mystic Street Bridge NOI Application Package
 - a. Project Narrative Memo
 - b. Resource Area Summary
 - c. Resource Area Delineation Plan
 - d. WPA Form 3 – Notice of Intent
 - e. WPA Appendix B – Wetland Fee Transmittal Form
 - f. Affidavit of Service
 - g. Abutter Notification Form
 - h. Certified List of Abutters
 - i. Project Locus Map
 - j. Abutter Map
 - k. USGS Topographic Quadrangle
 - l. FEMA Flood Insurance Rate Map
 - m. MassGIS Orthophoto & NHESP Estimated Habitat Map
 - n. Arlington Block Plan Maps 49 and 63
 - o. Site Photographs
 - p. *Geotechnical Report* dated December 2017, prepared by Gill Engineering Associates, Inc.
 - q. *Hydraulic Design Report*, dated December 2017, prepared by Weston & Sampson
 - r. *Bridge Replacement Plan A-10-015 (C10)*, dated April 1, 2021, prepared by Gill Engineering (25 sheets)
 - s. *Resource Area Plan*, dated April 1, 2021, prepared by Town of Arlington
2. Mystic Bridge Supplemental Materials Package
 - a. Memo from Wayne Chouinard, *Mystic Street Bridge: Notice of Intent – Supplemental Information*, dated December 28, 2022.
 - b. *Resource Area Plan*, revised December 27, 2022, prepared by Town of Arlington

APPROVAL ORDER OF CONDITIONS – Mystic Street Bridge
MassDEP File # 091-0349

- c. *Resource Area Plan*, revised December 27, 2022, prepared by Town of Arlington
- d. *Updated North Abutment Plan*, dated July 7, 2022, prepared by Gill Engineering, and stamped by Amy Spera, Registered Professional Engineer #50915
- e. *Updated South Abutment Plan*, dated July 7, 2022, prepared by Gill Engineering, and stamped by Amy Spera, Registered Professional Engineer #50915

Proceedings

The Conservation Commission held a public hearing for the Notice of Intent on December 1, 2022. The hearing was continued to January 19, 2023, and again to February 2, 2023, and was closed on that date. The Commission deliberated on February 2, 2023, and voted 7-0-0 to approve the Project with conditions under the Wetlands Protection Act (the “Act”) and voted 7-0-0 to approve the Project with conditions under the Arlington Wetlands Protection Bylaw (the “Bylaw”) and implementing regulations (Arlington Regulations for Wetlands Protection, March 1, 2018).

**Findings of Fact and Law under Arlington Wetlands Protection Bylaw
and Wetlands Protection Act**

- A. The project as approved will reconstruct the bridge located on mystic Street over Mill Brook in Arlington, Massachusetts.
- B. Mystic Street Bridge exists entirely within the Town of Arlington right of way. The bridge abuts the Town owned parcels at Cooke’s Hollow, is adjacent to the Community Safety Building, is otherwise surrounded by commercial development associated with Mystic Street.
- C. Resource Areas on site or within 100’ of the property lines include Bank, Riverfront Area, Adjacent Upland Resource Area, Bordering Land Subject to Flooding, and Land Under Water. The Commission finds that no Bordering Vegetated Wetlands exist in the area. Only those resource areas listed below will be altered.
 - i. $6,300 \pm$ square feet of Riverfront Area are on the site of the proposed project. $389 \pm$ square feet within the first 100 feet will be altered and replaced in-kind. No Riverfront Area in the outer 100 feet will be disturbed.
 - ii. $100 \pm$ square feet of Land Under Water will be temporarily disturbed and replaced in-kind.
 - iii. For mitigation, the Applicant will implement a debris net and turbidity curtain to protect Mill Brook during construction, provide erosion controls during construction, and remove the center pillar of the bridge, which will improve flow and help mitigate flooding. The Applicant will install new catch basins with deep sump catch basins and hooded outlets that separate sediment and floatables, thereby improving water quality.

APPROVAL ORDER OF CONDITIONS – Mystic Street Bridge
MassDEP File # 091-0349

These mitigation measures are compliant with the Climate Change Resilience standards in Section 31 of the Arlington Regulations for Wetlands Protection.

Conclusion

Based on the testimony at the public hearings, and review of the application materials and the documents listed above submitted during the public hearings, the Commission concludes that the proposed Project as conditioned will not have significant or cumulative effects upon the interests of the Resource Area values of the Massachusetts Wetlands Protection Act and the Arlington Bylaw for Wetlands Protection when the conditions imposed herein are implemented to protect the Resource Area values. With these conditions contained, the Project meets the performance standards in the Act and Bylaw and implementing regulations.

For the foregoing reasons, the Commission approves this project under the Act and Bylaw with the conditions stated herein the applications for work at Mystic Street Bridge.

Additional Special Conditions

In addition to the General Conditions (numbered 1 – 20 above), the Project is subject to the following Additional Special Conditions (under both the Act and Bylaw):

Administrative

21. Work permitted by this Order and Permit shall conform to the Notice of Intent, the approved plans and documents (listed above), and oral representations (as recorded in hearing minutes) submitted or made by the Applicant and the Applicant's agents or representatives, as well as any plans and other data, information or representations submitted per these Conditions and approved by the Commission.
22. The provisions of this Order and Permit shall apply to and be binding upon the Applicant and Applicant's assigns, tenants, lessees, property manager, employees, contractors, and agents.
23. The Applicant shall ensure that a copy of this Order and Permit, with any referenced plans, is always available on site, and that contractors, site managers, foremen, and sub-contractors understand its provisions.
24. The lead contractor shall sign and return to the Conservation Agent an acknowledgment that contractors, site managers, foremen, and sub-contractors cannot deviate from the approved plans without Commission approval.
25. If there are conflicting conditions within this Order and Permit, the stricter condition(s) shall govern.

APPROVAL ORDER OF CONDITIONS – Mystic Street Bridge
MassDEP File # 091-0349

26. No work shall begin under this Order and Permit until: (a) all other required permits or approvals have been obtained and (b) the appeal period of ten (10) business days from the date of issue of this Order has expired without any appeal being filed, and (c) proof that this Order has been recorded in the Registry of Deeds has been submitted to the Conservation Agent.
27. Prior to starting work, the Applicant shall submit to the Commission the names and 24-hour phone numbers of project managers or the persons responsible for site work or mitigation.

Pre-Construction

28. A debris net and/or tarp shall be installed over Mill Brook to capture construction debris during construction activities over Mill Brook. Specifications for the debris net and/or tarp shall be submitted to the Conservation Agent for approval at least ten weekdays prior to work commencing.
29. Before work begins, straw wattles and silt fencing shall be installed as outlined on the approved plans.
30. At least ten weekdays prior to work within Mill Brook, the contractor shall submit to the Conservation Agent for approval a turbidity control plan. Turbidity controls shall be capable of collecting sediment, suspended and floating materials; and filtering fine sediment. The control plan must include a contingency for unexpected high flows.
31. Prior to any work commencing, a sign no less than 2 square feet or more than 3 square feet, visible from the street, shall be displayed reading “**MA DEP File # 091-0349**” and not placed on a living tree.
32. The contractor shall contact the Conservation Agent (concomm@town.arlington.ma.us ; 781-316-3012) at least 72 hours prior to commencement of work to arrange for a pre-construction meeting with the on-site project manager to walk through the Order of Conditions and Permit for Work and walk the site to confirm the installation and placement of erosion controls prior to the start of any grading or construction work.
33. The contractor shall again contact the Conservation Agent (concomm@town.arlington.ma.us ; 781-316-3012) at least 72 hours prior to commencement of any work that will take place in Mill Brook, including but not limited to the work on the center pier.
34. Work within Mill Brook shall take place only between July 1 and February 28, and not between March 1 and June 30.

APPROVAL ORDER OF CONDITIONS – Mystic Street Bridge
MassDEP File # 091-0349

35. Work within Mill Brook shall take place only when there is no active fish migration or spawning within 200 feet of the project site. Work shall not otherwise disrupt the necessary life cycle movements of organisms indigenous to the water body. The Applicant shall notify the Conservation Agent of any observed migration, spawning, or other life cycle movement of aquatic organisms within 24 hours of observation. The Conservation Agent shall have the ability to require additional protections, including to stop work, during the duration of the life cycle movements.
36. Work within Mill Brook shall only take place under low-flow conditions or no-flow conditions. The contractor must plan for unexpected high flows.
37. The Commission, its employees, and its agents shall have the right of entry onto the site to inspect for compliance with the terms of this Order of Conditions and Permit until a Certificate of Compliance has been issued.

Erosion Control

38. At minimum, erosion controls shall consist of straw wattles and silt fencing, a turbidity curtain, a debris net/tarp as described in Conditions #28-30, as well as silt sack catch basin protections described at Condition #48. The Commission and its Agent shall have the discretion to require additional erosion/siltation control methods during construction if necessary.
39. The turbidity curtain within Mill Brook shall be installed only between July 1 and February 28, and not between March 1 and June 30.
40. All work shall be completed prior to the removal of the straw wattles and silt fencing.
41. Upon completion of the project, the Applicant shall remove and legally dispose off-site of all temporary erosion controls and other materials determined to be detrimental to the resource areas if left in place permanently.

Equipment

42. No heavy equipment may be stored overnight within 50 feet of the wetland and no refueling or maintenance of machinery shall be allowed within the 100-foot Buffer Zone, 200-foot Resource Area, and Adjacent Upland Resource Area or within any Resource Area unless otherwise approved by the Commission.
43. Construction entrances shall be used and maintained only where noted on approved plans.
44. Arrangements shall be made for any rinsing of tools, equipment associated with on-site mixing or use of concrete, rubber, or other materials such that the wastewater is disposed of in the concrete wash out station-at least 50 feet from the resource area. In no case may waste water be

APPROVAL ORDER OF CONDITIONS – Mystic Street Bridge
MassDEP File # 091-0349

discharged into or onto Resource Areas on or adjacent to the site. In no case may waste water be placed in storm drains. Any spillage of materials shall be cleaned up promptly.

Sweeping

45. The entire paved area shall be swept, and dirt or debris removed daily.
46. The areas of construction shall remain in a stable condition at the close of each construction day.

Vegetation

47. The Applicant shall protect all trees within 15 feet of the work area per the Town Wetlands Protection Regulations, Section 24 Vegetation Removal and Replacement. Area trees shall be covered with burlap or similar armored blankets installed to product specifications. Additional protections shall include 2"x4" boards between 6'-8' in length secured (not nailed) to the tree. The boards shall be installed vertically such that one end rests directly on the ground. Tree protection fencing with signage must also be installed at the drip line or as close to it as practicable. Further protection measures may be required by the Commission or its agent.

Stormwater

48. The Applicant shall protect all adjacent catch basins on the project site and within 100 feet of the limit of work using silt sacks. At minimum, performance of the silt sacks shall be monitored monthly on the first workday of each month. Monitoring shall include removing sediment from the sack and cleaning surfaces to ensure future performance. Degraded silt sacks showing holes, tears, or other wear shall be replaced immediately. All materials removed from silt sacks, including replace or removed sacks, shall be legally disposed of off-site.
49. The Applicant shall conduct catch basin sump cleanings as necessary to proximate catch basins at the end of the project work period.
50. The project shall not cause an increase in run-off or stormwater volume onto adjacent properties, either during construction or when completed.

Dewatering

51. Any dewatering operations shall conform to the following:
 - (a) If dewatering is needed, the Applicant must submit for approval a dewatering plan to the Conservation Agent or Conservation Commission.
 - (b) Any catch basins, drains, and outfalls to be used in dewatering operations shall be cleaned out before operations begin.
 - (c) Any water discharged as part of any dewatering operation shall be passed through filters, on-site settling basins, settling tank trucks, or other devices to ensure that no

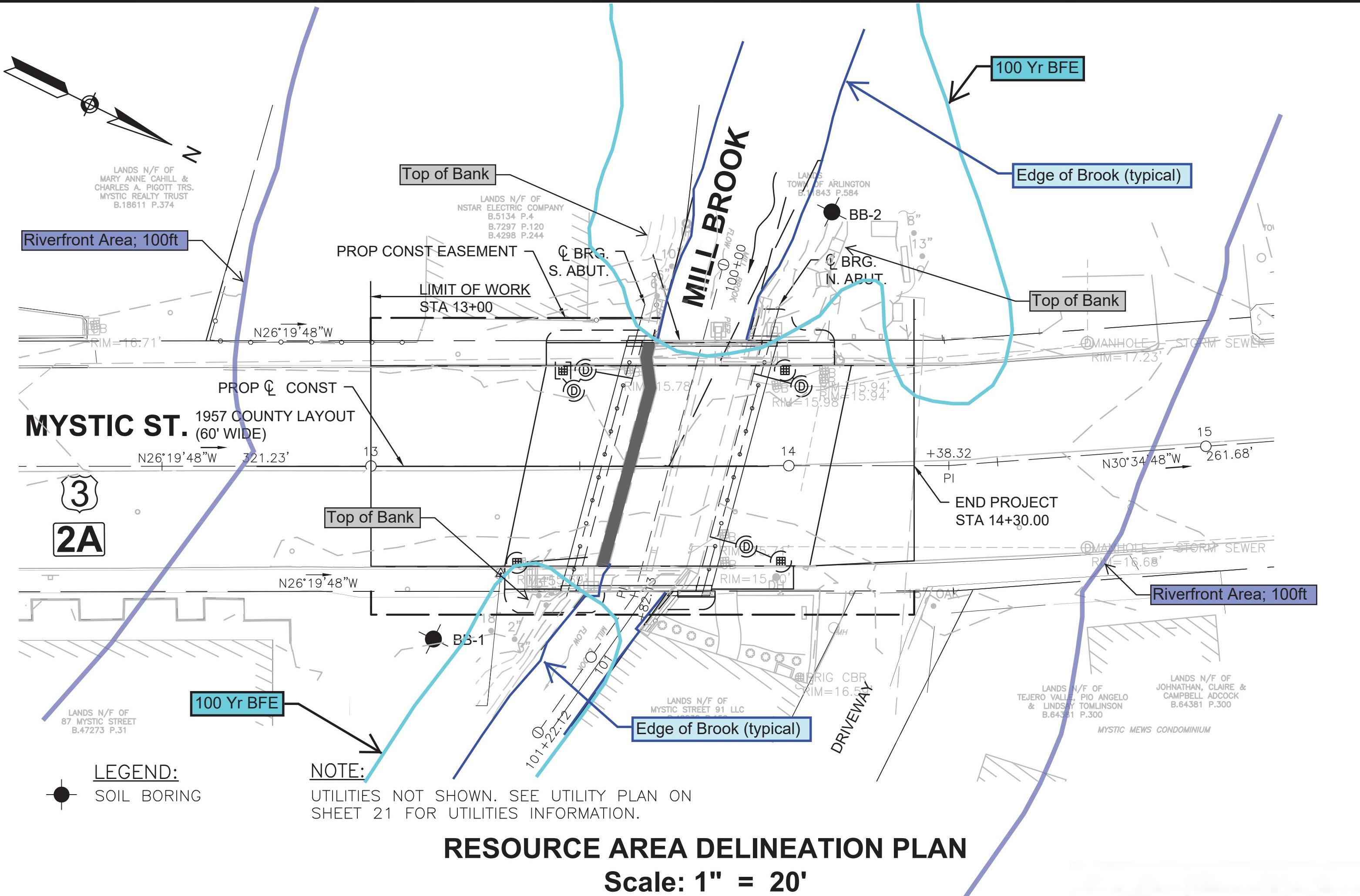
APPROVAL ORDER OF CONDITIONS – Mystic Street Bridge
MassDEP File # 091-0349

observable sediments or pollutants are carried into any Resource Area, street, drain, or adjacent property.

- (d) Measures shall be taken to ensure that no erosion or scouring shall occur because of dewatering operations.
- (e) Dewatering shall occur only where noted on approved plans.

Project Completion

- 52. Upon completion of the project or 60 days prior to the expiration of this Order of Conditions, the Applicant or a representative thereof shall file for a Certificate of Compliance.
- 53. When requesting a Certificate of Compliance for this Order of Conditions, the Applicant must submit written statement(s) from a professional engineer licensed and/or registered to work in Massachusetts. The statement submitted by said professional shall certify that the completed work complies with the plans referenced in this Order. The engineer shall provide an as-built plan and statement describing any differences.



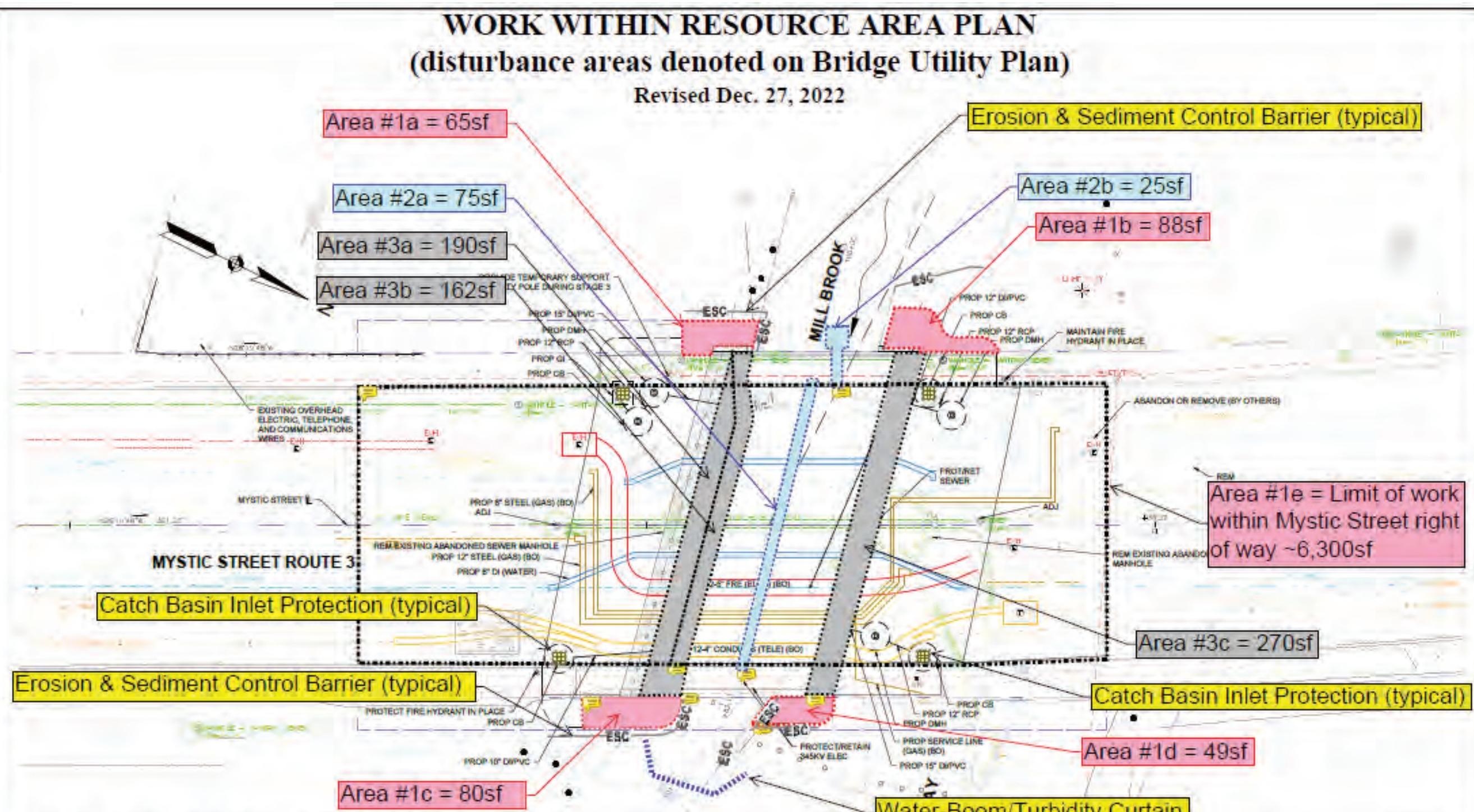
RESOURCE AREA DELINEATION PLAN

Scale: 1" = 20'

WORK WITHIN RESOURCE AREA PLAN

(disturbance areas denoted on Bridge Utility Plan)

Revised Dec. 27, 2022



WORK IN RESOURCE AREA

Area #1: work within the riverfront area and wetland buffer zone = 282sf; work in this area consists of excavation to install abutments and perform restoration of disturbed area with wetland restoration mix and/or rip-rap.

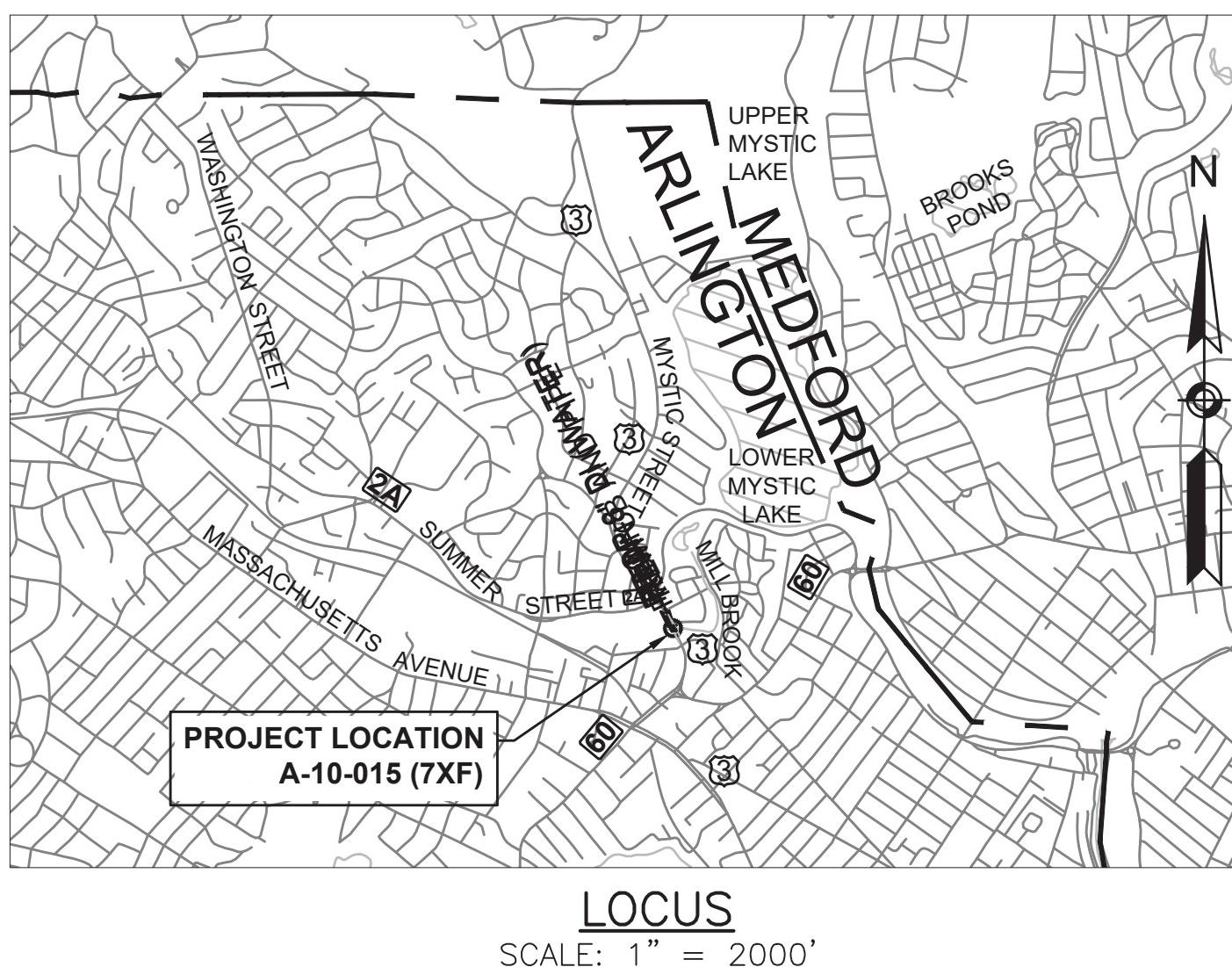
Area #2: work under water = 100sf; work shall consist of removing existing center piers. Piers and footing to be lifted with grapple and/or chains to minimize disturbance. Excavation method will not be utilized.

Area #3: Abutment Construction work located in the river front buffer area = 622sf; work in this area will not cause additional disturbance. Area on top of the northern abutment wall will be capped with a concrete top and the area behind the southern abutment wall will be filled with rip-rap. Utility work within Mystic Street right of way will be located between the curb line. Silt sack protection for catch basin inlets and daily sweeping is required.

For more detail see Disturbance Area Plan; revised Dec. 27, 2022

RESOURCE AREA SUMMARY

<u>Description</u>	<u>Disturbance</u>
Land Under Water:	100sf (temporary)
Bank Area:	282 sf (temporary)
Flood Zone: AE	22 sf (temporary)
Riverfront Area	
Abutments	282 sf
Utilities	<u>6,300 sf</u>
Total	6,582 sf (temporary)



CONSERVATION COMMISSION CONDITIONS LIST

CONSERVATION COMMISSION CONDITIONS LIST

PRE-CONSTRUCTРОМПОН

1. Work permitted by this Order and Permit shall conform to the Notice of Intent, the approved plans and documents (listed above), and oral representations (as recorded in hearing minutes) submitted or made by the Applicant and the Applicant's agents or representatives, as well as any plans and other data, information or representations submitted per these Conditions and approved by the Commission.
 2. The provisions of this Order and Permit shall apply to and be binding upon the Applicant and Applicant's assignees, tenants, property management company, employees, contractors, and agents.
 3. If there are conflicting conditions within this Order, the stricter condition(s) shall govern.
 4. No work shall begin under this Order until: (a) all other required permits or approvals have been obtained and (b) the appeal period of ten (10) business days from the date of issue of this Order has expired without any appeal being filed, and (c) this Order has been recorded in the Registry of Deeds. No work shall be started under this Permit until all other necessary permits or approvals have been obtained.
 5. The Applicant shall ensure that a copy of this Order of Conditions and Permit for work, with any referenced plans, is always available on site, and that contractors, site managers, foremen, and sub-contractors understand its provisions.
 6. Prior to starting work, the Applicant shall submit to the Commission the names and 24-hour phone numbers of project managers or the persons responsible for site work or mitigation.
 7. Before work begins, erosion and sediment controls shall be installed at the limits of the work area or as outlined on the approved plans. These will include a silt fence and a biodegradable 12-inch straw or silt wattle around the entire work area (hay bales are not allowed and silt socks are preferred).
 8. Prior to any work commencing, a sign no less than 2 square feet or more than 3 square feet, visible from the street, shall be displayed reading "MA DEP File # _____" and not placed on a living tree.
 9. The Applicant shall complete the proposed work during low flow conditions only.
 10. The contractor shall contact Conservation Agent; concomm@town.arlington.ma.us; or (781-316-3012) to arrange for a pre-construction meeting with the on-site project manager to walk through the Order of Conditions, confirm the wash out location, and walk the site to confirm the installation and placement of erosion controls prior to the start of any grading or construction work.
 11. The contractor shall provide written Notice of the commencement of work start date to the Conservation Agent 48 hours prior to start of work.
 12. The Commission, its employees, and its agents shall have the right of entry onto the site to inspect for compliance with the terms of this Order of Conditions and Permit until a Certificate of Compliance has been issued.
 13. Any backfill or reuse of on-site materials shall be free of contamination in accordance with the Massachusetts Contingency Plan, 310 CMR 40.0000. All fill used in connection with this project shall be clean borrow. The following shall be prohibited: chemically contaminated material; concrete and asphalt rubble; crushed glass; stumps and other solid waste or anthropogenic materials.

POST-CONSTRUCTION

 14. When requesting a Certificate of Compliance for this Order of Conditions, the Applicant must submit a written statement from a Massachusetts professional engineer, registered land surveyor, or registered landscape architect certifying that the completed work complies with the plans referenced in this Order or provide an as-built plan and statement describing any differences.

DUMPSTERS

 15. All dumpsters must be covered at the end of each workday, and no dumpsters will be allowed overnight within the 100-foot Buffer Zone or Adjacent Upland Resource Areas ("AURA") or other Resource Areas.

STOCKPILING

 16. No uncovered stockpiling of materials shall be permitted overnight within 100 feet of any waterway or water body. Stockpiling shall occur only where noted on approved plans.

be brought to final grade and reseeded and restabilized and shall be done so prior to the removal of the erosion control barrier. Erosion control measures shall be installed per the approved plans.

EQUIPMENT

 18. The Commission and its Agent shall have the discretion to require additional erosion/siltation control methods during construction if necessary.
 19. No heavy equipment may be stored overnight within 50 feet of the wetland and no refueling or maintenance of machinery shall be allowed within the 100-foot Buffer Zone, 200-foot Resource Area, and Adjacent Upland Resource Area or within any Resource Area.
 20. Construction entrances shall be used and maintained only where noted on approved plans.
 21. Arrangements shall be made for any rinsing of tools, equipment, etc. associated with on-site mixing or use of concrete or other materials such that the wastewater is disposed of in the concrete wash out station-at least 50 feet from the resource area. In no case may waste water be discharged into or onto Resource Areas on or adjacent to the site. In no case may waste water be placed in storm drains. Any spillage of materials shall be cleaned up promptly.

SWEEEPING

 22. Any dirt or debris spilled or tracked onto any paved streets shall be swept up and removed daily.
 23. The areas of construction shall remain in a stable condition at the close of each construction day.

DEWATERING

 24. Any dewatering operations shall conform to the following:
 - (a) Notify the Conservation Commission that dewatering is required.
 - (b) Any catch basins, drains, and outfalls to be used in dewatering operations shall be cleaned out before operations begin.
 - (c) Any water discharged as part of any dewatering operation shall be passed through filters, on-site settling basins, settling tank trucks, or other devices to ensure that no observable sediments or pollutants are carried into any Resource Area, street, drain, or adjacent property.
 - (d) Measures shall be taken to ensure that no erosion or scouring shall occur on public or private property, or on the banks or bottoms of water bodies, because of dewatering operations.
 - (e) Dewatering shall occur only where noted on approved plans.

PLANTINGS

 25. Prior to plant installation, the Applicant shall submit planting plan details to the Conservation Commission for approval. Planting details shall include plant sizes, Latin names, regular names, number of plants, and transported method (containerized, balled-and-burlapped, etc.). All plantings shall be native and be installed and maintained according to the standards of the American Association of Nurserymen (AAN). This shall be a continuing condition that survives the expiration of the permit and shall be included in any Certificate of Compliance as a continuing condition.
 26. The Applicant shall protect all area trees per the Town Wetlands Protection Regulations, Section 24 Vegetation Removal and Replacement, protecting trees through securing (not nailing) 2x4 boards, between 6-8 feet in length, around tree base. The boards shall be installed vertically such that one end is installed directly into the ground. Alternative protection measures must be approved by the Commission or its agent.
 27. The Applicant shall replace all removed trees per the Town Wetlands Protection Regulations, Section 24 Vegetation Removal and Replacement.

survival rate of at least 80% must be maintained for the approved restoration plantings. A monitoring report shall be submitted annually in November for the three-year monitoring period and shall include the number and types of restoration plantings evaluated, condition of the plantings, and status of invasive plant removal. The Applicant must provide a monitoring report by a qualified consultant for survival of all approved plantings. The monitoring report must include measures to remove invasive species if they are discovered.

CHEMICALS

 29. To avoid adding excess nitrogen runoff, the Applicant shall only treat the lawn area with slow-release nitrogen fertilizer. Application of lawn fertilizer cannot occur in the summer, or after storm events. Lawn fertilizer shall only be applied twice a year, in spring and fall. This shall be a continuing condition that survives the expiration of the permit and shall be included in any Certificate of Compliance as a continuing condition.
 30. New plantings shall only be fertilized once, during the initial planting year. No pesticides or rodenticides shall be used to treat pest management issues. This shall be a continuing condition that survives the expiration of the permit and shall be included in any Certificate of Compliance as a continuing condition.
 31. Only the herbicides and herbicide treatment methods stated within the NOI are approved to treat invasive plants. No other herbicides or treatment methods are approved. This shall be a continuing condition that survives the expiration of the permit and shall be included in any Certificate of Compliance as a continuing condition.

PERVIOUS SURFACES

 32. Pervious surfaces shown on the project plans shall be maintained and not be replaced by impervious surfaces. This shall be a continuing condition that survives the expiration of the permit and shall be included in any Certificate of Compliance as a continuing condition.
 33. Installed permeable surfaces shall be maintained in perpetuity. Prior to construction, the Applicant shall provide an operations and maintenance plan for installed permeable surfaces and, at the discretion of the Commission, a signed copy of a contract for professional maintenance. This shall be a continuing condition that survives the expiration of the permit and shall be included in any Certificate of Compliance as a continuing condition.

STORMWATER

 34. The Applicant shall protect all adjacent catch basins using silt socks.
 35. The Applicant shall conduct catch basin sump cleanings as necessary to proximate catch basins at the end of the project work period.
 36. The project shall not cause an increase in run-off or stormwater volume onto adjacent properties, either during construction or when completed.

APPENDIX F: MWRA 8M Permit



MASSACHUSETTS WATER RESOURCES AUTHORITY

Chelsea Facility
2 Griffin Way
Chelsea, Massachusetts 02150

Telephone: (617) 242-6000
Facsimile: (617) 305-5990

Frederick A. Laskey
Executive Director

Certified Mail

November 9, 2018

Town of Arlington DPW
51 Grove Street
Arlington, MA 02476

Re: MWRA – 8(m) Permit # 18-07-1316M
Effective Date: November 9, 2018

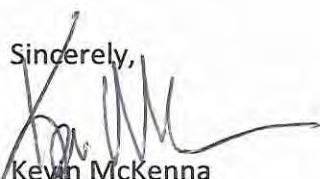
Attn: Wayne Chouinard:

Enclosed please find 8(m) permit number 18-07-1316M. The permit is effective as of November 9, 2018.

The permit authorizes you to conduct operations crossing within or near an easement or other property interest held by MWRA and provides important information. All of the requirements and conditions of the permit are in effect so **please read the permit upon receiving it.**

Permittee or its designee to provide at least **72-hour** prior notice to the MWRA's **Inspection Department**, by calling Kevin McKenna **(617) 305-5956**, located at 2 Griffin Way, Chelsea, MA 02150

If you have any questions pertaining to the permit's terms and conditions or any information set forth in this letter, please contact me at **(617) 305-5956**.

Sincerely,

Kevin McKenna
Project Manager
TRAC

MASSACHUSETTS WATER RESOURCES AUTHORITY

PERMIT

8m Permit # 18-07-1316M

11-Sep-18

Town of Arlington DPW
51 Grove Street
Arlington, MA 02476

This Permit is subject to the 8(m) Permit Terms and Conditions, and the 8(m) Permit Special Terms and Conditions, if any, attached hereto and made a part hereof. Permittee agrees that it shall be bound by, and shall comply with, said Terms and Conditions.

The land is described as follows:

MWRA Mill Brook Valley Sewer Section 79A between Sta. 4+37 and 4+69 as depicted within "Mystic Street Siphon Plan and Profile" Sheet C-1 and D-3 prepared by Weston and Sampson.

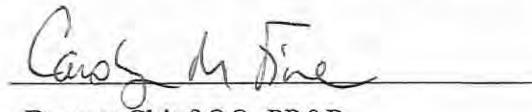
You may use the land for the purpose of:

The Town of Arlington as part of their siphon replacement project and relative bridge replacement project over Mill Brook will be temporarily redirecting flows to the Mill Brook Valley Sewer. Approximately 35,000 gpd with the project expected to last 4 weeks. The Town and their contractor are responsible for securing MWRA structures and mitigating any resulting sewer odors in the area.

Approved as to Form:
Massachusetts Water Resources Authority

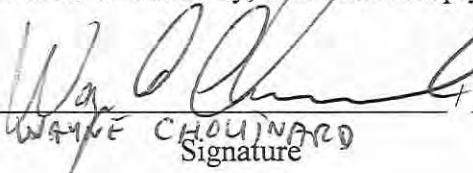

Law Division 9/26/18

Approved
Massachusetts Water Resources Authority


Deputy Chief OO, PP&P

This Permit is subject to the 8(m) Permit Terms and Conditions, and the 8(m) Permit Special Terms and Conditions, if any, attached hereto and made a part hereof. Permittee agrees that it shall be bound by, and shall comply with, said Terms and Conditions.

Permittee:


WAYNE A. CHOUINARD
Signature

Print Name

This permit shall have no effect until such time as the Authority issues the fully executed original of this Permit.

8(m) PERMIT TERMS AND CONDITIONS

1. Permittee's use of the land shall at no time interfere with the Authority's activities or operations on the land. The Authority has the right to review and approve all of the Permittee's work including such plans and specifications as the MWRA deems necessary. Any proposed future work beyond the scope of this permit must have the prior written approval of the MWRA, which approval will not be unreasonably withheld.
2. The Permittee and its successors and assigns shall indemnify, hold harmless and defend the Authority and its successors and assigns from all damages and/or claims arising from the acts or omissions of the Permittee on the Premises or of anyone acting by or through the Permittee. The Permittee's obligations under this paragraph shall include payment to the Authority of all costs to repair damage caused to the Authority's property.
3. The granting of this permit shall in no way interfere with the rights of the Authority to exercise its existing rights in or over the permitted land. Permittee acknowledges that the Authority may enter upon the location at any time in order to carry out the inspection, maintenance, repair, and replacement of its property.
4. The Authority may revoke this permit at any time. The sale or disposition of the land by its owner will cause this permit to terminate without further notice. Permittee will give the Authority at least 72 hours notice before commencing the operations as pursuant herein. This permit may not be assigned or transferred.
5. No blasting, drilling or other activity that could in any way affect the integrity or operability of the Authority's property or use of the Premises shall be permitted without express prior written approval of the Authority.
6. The Permittee shall remove, at its own expense, within six months of the date of written notice from MWRA, any or all conduits and appurtenances installed by the Permittee under this permit if, in the MWRA's sole discretion, such removal is necessary for the operation, maintenance or replacement of the MWRA's infrastructure.
7. In consideration of the issuance of this Permit, Permittee releases Massachusetts Water Resources Authority from any and all claims, suits, and causes of actions of any kind or description arising out of or related to any work or activity under this permit, including without limitation those for loss, damage or destruction of property, for personal injury or death of any consultant, contractor, employee, or agent of either Permittee or any entity acting by or through it hereunder, and from any and all damages arising out of any such claims including any direct, indirect or consequential damages, economic loss or loss of profits, together with all attorneys' fees and any related costs and expenses.

8. The permittee shall conduct design, construction and excavation in accordance with all federal, state and local safety regulations including but not limited to federal OSHA regulations (29 CFR 1926) and Massachusetts Department of Public Safety regulations (520 CMR 14.00). During construction, appropriate sheeting and shoring measures must be taken to protect the integrity of the Authority's water/ sewer mains. Any sheeting and shoring design must be submitted to MWRA prior to the start of the construction. The submitted design of excavation trench support and all temporary supports associated with excavating under or near MWRA water and sewer lines shall be stamped by a Professional Engineer, licensed in Massachusetts.
9. The Permittee is responsible to adjust any or all MWRA frames and covers to grade within their limits of work in accordance with the plans referenced in this permit. The Authority will provide the contractor with new replacement MWRA frames and covers that have been deemed unusable by Authority personnel.

APPENDIX G: Miscellaneous Documents

- Historic Trolley Track Plan

T-4

ARLINGTON

